

# Alaska Scientific Crime Detection Laboratory

## Forensic Alcohol Estimate of the Uncertainty of Measurement

Issued: 12/20/2013

Blood Ethanol

The Forensic Alcohol discipline utilized data from all casework of blood alcohol analysis performed on both Agilent gas chromatograph/mass spectrometers equipped with a headspace autosampler between June 2012 and October 2013.

The ASCLD/LAB-*International* Guidance on the Estimation of Measurement Uncertainty – ANNEX D (AL-PD-3063 Ver 1.0) was used as a template for this measurement uncertainty report.

### Test Method Information

The test method determines the concentration of ethanol in ante-mortem and post-mortem blood specimens.

- All analysts performing casework participated in this test method
  - o Two heated headspace gas chromatographs are available for use to each analyst. The chromatographs are identified as "HS1" and "HS2".
  - o Three dilutor/dispensers are approved for use. Only one is considered to be in service for blood alcohol sample preparation at a given time. The dilutor/dispensers are identified as "Betty", "Wilma", and "ML600-1".
  - o The heated headspace gas chromatograph and dilutor/dispenser used for a given analysis is recorded in the analyst's case notes.
- The method is a chromatographic method that includes the use of an internal standard (n-propanol)
  - o Sample introduction is by headspace autosampler
  - o Calibrators are NIST traceable certified reference standards spanning the reportable concentration range
    - The certified reference standards are not altered prior to sample preparation
  - o Calibration model is linear regression
    - Method validation documented equal variance across linear range of 0.020 g/100 mL – 0.500 g/100 mL
  - o Quality control samples include:
    - Blood matrix control
    - Certified reference standards at a low and high concentration range from the same supplier that the calibrator certified reference standards are from.
      - The certified reference standards are not altered prior to sample preparation
    - Negative aqueous control
    - Mixed volatiles selectivity control

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- Specimens are analyzed in duplicate
  - Procedure administrative requirement of 0.005 g/100 mL or 5% (whichever is greater) agreement between replicates
  - The average of the two measurements truncated to 4 decimal places is calculated. The reported value is the calculated average truncated to 3 decimal places.
- Calibrators, quality control samples, and measurand aliquots are all pipetted using the same equipment for a given analysis batch
  - The equipment is a dilutor/dispenser that dilutes the specified sample volume with a specified volume of aqueous internal standard.
- The multi-point calibration curve covering the reportable concentration range is established each analytical run.

This information was recorded in an excel document titled "M of U Control Data". The data is also included at the end of this report.

Note: Regardless of the number of digits that are shown in a cell, Excel carries the maximum number of digits in the background and will use the entire number for further calculations. All calculations shown in this report are taken from calculations made in Excel.

### Measurement Traceability

The traceability for this measurement process is established through the calibrators used to generate the calibration curve on the measuring system as well as through the calibration of other equipment used in the measurement process where the calibration of the equipment is viewed to have a significant effect on sampling or the accuracy of the test result.

- All certified reference standards have been purchased from a Reference Material Producer (Cerilliant) that meets Clause 3.3.3 of the ASCLD/LAB Policy on Measurement Traceability.
- Casework utilized for this initial study was performed with the use of diluter/dispensers that were calibrated annually by the manufacturer, Hamilton. Hamilton performs calibrations based on an unbroken chain of calibrations to N.I.S.T.; and is ISO/IEC 17025:2005 accredited however their scope does not include calibration services from our review of their documentation provided to us.

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- In December 2013 the diluter/dispensers were calibrated by a new vendor, Calibrate, Inc., onsite at the laboratory. Calibrate, Inc. is accredited to ISO/IEC 17025:2005 for external calibrations for this type of equipment.

### Measurement Assurance

The blood matrix control is used as quality control to ensure the ongoing performance of the test method. This measurement assurance check standard contains ethanol, the analyte of interest, near the statutory level for driving under the influence of ethanol. The quality control material is purchased from Utak Laboratories in individually packaged aliquots of the same lot.

- Upon receipt of a new lot, the concentration is determined in-house through replicate measurements of each aliquot container.
- A criterion for acceptable performance has been administratively defined as +/- 0.005 g/100 mL of the defined concentration.
- The check standard containers are stored frozen until the day of use.
- The laboratory has measured 5 lots of quality control material with a combined total of greater than 200 measurements.

Certified reference standards at a low and high concentration are also used as quality control to ensure the ongoing performance of the test method.

- Reference values are:
  - o Used in addition to the blood matrix control to ensure validity of the test method across the concentration range
  - o Used to verify the calibration curve
  - o Used to evaluate method bias on an ongoing basis

The laboratory has not conducted routine internal performance checks on the diluter/dispensers. External calibrations are performed on an annual basis of the diluter/dispensers.

### NIST 8-Step Process for Estimating and Reporting Measurement Uncertainty

#### ***Step 1: Specify the measurement process***

The procedure for this measurement process is described in the Quantitative Alcohol Procedure Manual.

The measurement process can be shown by the following mathematical expression:

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$$C_{\text{measurand}} = C_{\text{calibrators}} \times \frac{I_{\text{measurand}}}{I_{\text{calibrators}}} + b \pm U$$

Where,

- $I$  is the instrument response
- $C$  is the concentration
- $b$  is a bias
- $U$  is the expanded uncertainty

Each of these influences on the measuring process will have uncertainty components that will be considered.

### ***Step 2: Identify uncertainty components***

List of uncertainty components considered:

- Staff
  - o Multiple analysts
  - o Training
  - o Experience
- Calibrators
  - o Certified reference standards - uncertainty in the stated reference value
  - o Not matrix matched to measurand
- Quality Control Samples
  - o Certified reference standards – same source; uncertainty in the stated reference value
  - o Matrix control – stability
- Sampling of Measurand
  - o Homogenization – mixing prior to sampling
  - o Temperature – all calibrators, quality control samples, and the measurand are brought to room temperature
    - Variation in the time allowed to reach room temperature
    - Variation in room temperature at different times of year
- Internal Standard Preparation
  - o Components:
    - n-propanol
  - o Concentration
- Preparation of Aliquots of Calibrators, Quality Control Samples, and Measurand

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- Dilutor/Dispenser
  - Variation in which one used
  - Volume of sample and volume of internal standard
    - Calibration uncertainty or pre-defined criteria for check of calibration status
  - Variation in use by multiple staff
- Headspace vials:
  - Crimping
  - Material of stopper
  - Time between dispensing into and sealing vials
- Time between replicate sampling of measurand
- Calibration of measuring system
  - Uncertainty in the calibrator values
  - Matrix of calibrators and measurand
  - Instrument precision
- Analysis
  - Instrument parameter settings
  - Variation in chromatograph used
  - Interference from matrix
  - Interference from reagents
  - Interference from other compounds
  - Stability of sample(s) from preparation through analysis
- Data Processing
  - Calibration model
  - Integration parameters
  - Processing algorithms

### ***Step 3: Quantify uncertainty components***

The laboratory has existing data from the measurement process.

The calibration model was determined during method validation and was shown through the use of residual plots to have equal variance across the linear range. The residual plots are located in an excel document titled “Uncertainty Budget” and included at the end of this report. Therefore, the laboratory is going to calculate an estimation of measurement uncertainty for the entire reportable concentration range.

Each analytical run includes the duplicate analysis of each quality control sample (0.025 and 0.300 g/100mL aqueous certified reference standards and a blood matrix control) near the beginning and end of the sample sequence. All analysts have made

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measurements using this method over the time span of greater than one year using both gas chromatographs and two of the three diluter/dispensers.

The same batch of internal standard is used for all samples in an analytical batch. This leaves variation in the amount of internal standard added to each calibrator, quality control sample, and measurand sample by the pipette dilutor as the only aspect of the internal standard that has an influence on the measurement result.

The table below lists each uncertainty component considered and how it will be evaluated.

Uncertainty Component	Method of Evaluation
Staff	
Multiple Analysts	Type A -Blood Matrix QC reproducibility data
Training	Type A -Blood Matrix QC reproducibility data
Experience	Type A -Blood Matrix QC reproducibility data
Calibrators	
Uncertainty in stated reference value	Type B - Certificate of Analysis
Matrix of calibrators and measurand	Type A -Blood Matrix QC reproducibility data
	Type B - Replicate agreement requirement

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Quality Control Samples	
Certified Reference Standards	Bias Evaluation
Matrix control - stability	Type A -Blood Matrix QC reproducibility data
Sampling of Measurand	
Homogenization	Type B - Replicate agreement requirement
Temperature	Type A -Blood Matrix QC reproducibility data Type B - Replicate agreement requirement
Internal Standard Preparation	
Components	No influence
Concentration of Internal Standard	No influence
Preparation of aliquots	
Pipette Dilutor	Type A -Blood Matrix QC reproducibility data (QC is sampled at the beginning and end of each batch and not all at one time)
Variation in use by multiple staff	Type A -Blood Matrix QC reproducibility data
Headspace vial	Type A -Blood Matrix QC reproducibility data
Time between replicate sampling	Type B - Replicate agreement requirement
Calibration of Measuring System	
Uncertainty in the calibrator values	Covered in Calibrators section
Matrix of calibrators and measurand	Covered in Calibrators section
Instrument precision	Type A -Blood Matrix QC reproducibility data

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Analysis	
Instrument parameters	Type A -Blood Matrix QC reproducibility data
Variation in chromatograph used	Type A -Blood Matrix QC reproducibility data
Interference from matrix	Covered in Sampling of Measurand section
Interference from reagents	Quality control - blank analysis
Interference from other compounds	Quality control - mixed volatiles analysis
Stability of samples	Type A -Blood Matrix QC reproducibility data Type B - Replicate agreement requirement
Data Processing	
Calibration model	Type A -Blood Matrix QC reproducibility data
Integration parameters	Type A -Blood Matrix QC reproducibility data
Processing algorithms	Type A -Blood Matrix QC reproducibility data

### Type A – Blood Matrix QC reproducibility data

Over one year of data has been collected from the analysis of five lots of blood matrix controls. The percent relative standard deviation was calculated for each lot. Because the mean of each lot may be different but the variation within each lot is assumed to be the same, a pooled relative standard deviation was the statistic used to estimate this uncertainty component. The result of this calculation is:

$$\%RSD_{pooled} = \pm 1.1224\%$$

Calculations performed:

Mean of data from each lot

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

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Standard deviation of each lot

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

Percent relative standard deviation of each lot

$$\%RSD = 100 \times \frac{s}{\bar{x}}$$

Pooled percent relative standard deviation

$$\%RSD_{pooled} = \sqrt{\frac{(n_1 - 1)\%RSD_1^2 + (n_2 - 1)\%RSD_2^2 + \dots + (n_k - 1)\%RSD_k^2}{n_1 + n_2 + \dots + n_k - k}}$$

Where  $k$  is the number of lots pooled and  $n$  is the number of measurements made for a specific lot.

Type B – Replicate agreement requirement:

The laboratory procedure requires that two samples be taken from the homogenized measurand and the ethanol concentration of the two aliquots is within  $\pm 5\%$  of the average or the analysis is repeated.

$$\text{Replicate Agreement} = 5\%$$

Type B – Certificate of Analysis

All certificates of analysis for certified reference standards used for calibrators and aqueous controls report a relative standard uncertainty of the listed concentration of:

$$\text{Relative Standard Uncertainty} = \pm 0.175\%$$

### ***Step 4: Convert quantities to standard uncertainties***

Type A – Blood Matrix QC reproducibility data

When analyzing case samples, two measurements are made of the measurand and the average truncated to 3 decimal places is reported. In the same fashion, the relative standard deviations calculated from the blood matrix QC reproducibility data is based on the average of duplicate measurements of quality control samples truncated to 3 decimal places. The pooled relative standard deviation of the blood matrix QC reproducibility data will be used without further calculations.

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$$\%RSD_{\text{pooled}} = \pm 1.1224\%$$

Type B – Replicate agreement requirement:

This component is evaluated as a rectangular distribution to determine its standard uncertainty.

$$\text{Standard Uncertainty} = \frac{5\%}{\sqrt{3}}$$

$$\text{Standard Uncertainty} = \pm 2.8868\%$$

Type B – Certificate of Analysis

The certificates of analysis for certified reference standards used already report standard uncertainties. No conversions are needed.

$$\text{Relative Standard Uncertainty} = \pm 0.175\%$$

### ***Step 5: Calculate the combined standard uncertainty***

The Root Sum of the Squares formula will be used to calculate the combined uncertainty.

$$\text{Combined Std. Uncertainty} = \sqrt{\%RSD_{\text{pooled}}^2 + \text{Std Unc}_{\text{replicates}}^2 + \text{Std Unc}_{\text{stds cals}}^2}$$

$$\text{Combined Standard Uncertainty} = \pm 3.1022\%$$

### ***Step 5: Calculate the combined uncertainty continued – evaluation of bias***

Bias will be evaluated by comparing the calculated %bias from the low (0.025 g/100mL) and high (0.300 g/100mL) certified reference standard controls to the expanded combined standard uncertainty ( $k=2$ ). Any observed bias will be viewed as insignificant by the laboratory if:

$$\%bias < 2 \times \text{Combined Standard Uncertainty}$$

where,

$$\%bias = 100 \times \frac{\bar{x}_{\text{lab}} - x_{\text{ref}}}{x_{\text{ref}}}$$

Duplicate measurements of the certified reference standard controls, truncated to 4 decimal places were averaged and the result was truncated to 3 decimal places. The

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mean of these averages for a specific control was then compared to the control's target value to evaluate bias in the method. The results of these %bias calculations for each control were:

$$\%bias_{0.025} = + 0.2\%$$

$$\%bias_{0.300} = + 1.0\%$$

Compared to the expanded combined standard uncertainty of:

$$\text{Expanded Combined Standard Uncertainty} = \pm 6.2044\%$$

these biases are considered insignificant. However, the uncertainty in the reference values of these controls will be added to the combined standard uncertainty.

Combined Std. Uncertainty

$$= \sqrt{\%RSD_{\text{pooled}}^2 + \text{Std Unc}_{\text{replicates}}^2 + \text{Std Unc}_{\text{stds cals}}^2 + \text{Std Unc}_{\text{stds ctrls}}^2}$$

$$\text{Combined Standard Uncertainty} = \pm 3.1072\%$$

### ***Step 6: Expand the combined standard uncertainty by coverage factor (k)***

The combined standard uncertainty will be expanded to a 95% coverage probability (coverage factor k = 2):

$$\text{Expanded Combined Standard Uncertainty (k=2)} = \pm 6.2143\%$$

### ***Step 7: Evaluate the expanded uncertainty***

Upon review of the combined standard uncertainty components, it was determined that the administrative requirement of replicate measurements being within  $\pm 5\%$  of the average was the largest contributor to overall measurement uncertainty. A review of measurand data obtained with this method showed that 95% of samples analyzed had a replicate agreement of  $\pm 3\%$  or less. This data is in an excel document titled "Blood Alcohol Measurement of Uncertainty RPD Data" and is included at the end of this report. Changing the administrative replicate agreement requirement from 5% to 3% affects the measurement uncertainty as follows:

Type B – Replicate agreement requirement:

$$\text{Standard Uncertainty} = \frac{3\%}{\sqrt{3}}$$

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Standard Uncertainty =  $\pm 1.7321\%$

Combined standard uncertainty (not including control standard uncertainty):

Combined Standard Uncertainty =  $\pm 2.0713\%$

Expanded combined standard uncertainty ( $k=2$ , not including control standard uncertainty):

Expanded Combined Standard Uncertainty =  $\pm 4.1427\%$

Bias is still considered insignificant when compared to the updated expanded combined standard uncertainty.

Expanded combined standard uncertainty ( $k=2$ , including control standard uncertainty):

Expanded Combined Standard Uncertainty =  $\pm 4.1574\%$

Effective with reporting measurement uncertainty (December 20, 2013) the administrative requirement for replicate agreement has been changed to 3% and a revised manual issued.

The laboratory has decided to perform periodic internal checks between the annual external checks to continually ensure proper functioning of the equipment. This procedure requires the use of a calibrated balance (by an external ISO/IEC 17025:2005 accredited vendor) and specifies that if the diluter/dispenser does not pass a check, then the equipment will be removed from use and a calibration by the accredited calibration service provider will be obtained.

The laboratory also has a procedure to check the calibration status and to ensure the proper functioning of the balances used in the diluter/dispenser procedure to ensure proper functioning. The laboratory uses calibrated mass reference standards with established measurement traceability to perform intermediate checks of the calibration status of the balances.

A requirement to perform an internal check of the diluter/dispensers within 5-6 months of the external calibration is effective with a revised manual issued December 20, 2013.

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### ***Step 8: Report the uncertainty***

The expanded combined standard uncertainty rounded to 2 significant figures is:

$$\text{Expanded Combined Standard Uncertainty} = \pm 4.2\%$$

The measurement result and the expanded uncertainty will be reported in the same units. The coverage probability used to expand the uncertainty will also be reported. A table showing the measurement uncertainty for a representative range of reported blood alcohol results is included at the end of this report.

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Beverage Ethanol

The Forensic Alcohol discipline utilized data from all casework of beverage alcohol analysis performed on both Agilent gas chromatograph/mass spectrometers equipped with a headspace autosampler between June 2012 and October 2013. Beverage casework can be performed in the batch as blood alcohol analysis and the same quality control procedures are used regardless of sample type.

Note: The ASCLD/LAB Guidance on Estimation of Measurement Uncertainty – ANNEX D (AL-PD-3065 Ver 1.0) was used as a template when writing this measurement uncertainty report.

### Test Method Information

The test method determines the concentration of ethanol in beverage specimens.

- All analysts performing casework participated in this test method
  - o Two heated headspace gas chromatographs are available for use to each analyst. The chromatographs are identified as "HS1" and "HS2"
  - o Three dilutor/dispensers are approved for use. Only one is considered to be in service for blood alcohol sample preparation and only one is considered to be in service for preliminary beverage dilution at a given time. The dilutor/dispensers are identified as "Betty", "Wilma", and "ML600-1".
  - o The heated headspace gas chromatograph and dilutor/dispensers used for a given analysis are recorded in the analyst's case notes.
- The method is a chromatographic method that includes the use of an internal standard (n-propanol)
  - o Sample introduction is by headspace autosampler
  - o Calibrators are NIST traceable certified reference standards spanning the reportable concentration range
    - The certified reference standards are not altered prior to sample preparation
  - o Calibration model is linear regression
    - Method validation documented equal variance across linear range of 0.020 g/100 mL – 0.500 g/100 mL
  - o Quality control samples include:
    - Blood matrix control
    - Certified reference standards at a low and high concentration range from the same supplier as the calibrator certified reference standards.

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- The certified reference standards are not altered prior to sample preparation
  - Negative aqueous control
  - Mixed volatiles selectivity control
- Beverage specimens are initially diluted using a dedicated dilutor/dispenser before subsequent dilution with the blood alcohol dilutor/dispenser.
- Specimens are analyzed in duplicate
  - Procedure administrative requirement of 0.005 g/100 mL or 5% (whichever is greater) agreement between replicates
  - The average of the two measurements truncated to 4 decimal places is calculated. The reported value in % (v/v) is the calculated average truncated to 3 decimal places in g/100 mL multiplied by the initial dilution factor and divided by the density of ethanol (0.789 g/mL). The result of this calculation is truncated to 1 decimal place and reported.
- Calibrators, quality control samples, and measurand aliquots are all pipetted using the same equipment for a given analysis batch
  - The equipment is a dilutor/dispenser that performs the initial beverage dilution and another dilutor/dispenser that dilutes the specified sample volume with a specified volume of aqueous internal standard.
- The multi-point calibration curve covering the reportable concentration range is established each analytical run.

This information was recorded in an excel document titled "M of U Control Data". The data is also included at the end of this report.

Note: Regardless of the number of digits that are shown in a cell, Excel carries the maximum number of digits in the background and will use the entire number for further calculations. All calculations shown in this report are taken from calculations made in Excel.

### Measurement Traceability

The traceability for this measurement process is established through the calibrators used to generate the calibration curve on the measuring system as well as through the calibration of other equipment used in the measurement process where the calibration of the equipment is viewed to have a significant effect on sampling or the accuracy of the test result.

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- All certified reference standards have been purchased from a Reference Material Producer (Cerilliant) that meets Clause 3.3.3 of the ASCLD/LAB Policy on Measurement Traceability
- Casework utilized for this initial study was performed with the use of diluter/dispensers that were calibrated annually by the manufacturer, Hamilton. Hamilton performs calibrations based on an unbroken chain of calibrations to N.I.S.T.; and is ISO/IEC 17025:2005 accredited however their scope does not include calibration services from our review of their documentation provided to us.
- In December 2013 the diluter/dispensers were calibrated by a new vendor, Calibrate, Inc., at the laboratory. Calibrate, Inc. is accredited to ISO/IEC 17025:2005 for external calibrations for this type of equipment.

### Measurement Assurance

The blood matrix control is used as quality control to ensure the ongoing performance of the test method. This measurement assurance check standard contains ethanol, the analyte of interest, near the statutory level for driving under the influence of ethanol. The quality control material is purchased from Utak Laboratories in individually packaged aliquots of the same lot.

- Upon receipt of a new lot, the concentration is determined in-house through replicate measurements of each aliquot container.
- A criterion for acceptable performance has been administratively defined as +/- 0.005 g/100 mL of the defined concentration.
- The check standard containers are stored frozen until the day of use.
- The laboratory has measured 5 lots of quality control material with a combined total of greater than 200 measurements.

Certified reference standards at a low and high concentration are also used as quality control to ensure the ongoing performance of the test method.

- Reference values are:
  - o Used in addition to the blood matrix control to ensure validity of the test method across the concentration range
  - o Used to verify the calibration curve
  - o Used to evaluate method bias on an ongoing basis
  - o Used as QC reproducibility data when assessing beverage alcohol measurement uncertainty

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The laboratory has not conducted routine internal performance checks on the diluter/dispensers. External calibrations are performed on an annual basis of the diluter/dispensers.

### NIST 8-Step Process for Estimating and Reporting Measurement Uncertainty

#### ***Step 1: Specify the measurement process***

The procedure for this measurement process is described in the Quantitative Alcohol Procedure Manual (QAPM2013 R1).

The measurement process can be shown by the following mathematical expression:

$$C_{\text{measurand}} = \frac{\text{Dilution factor}}{\text{Ethanol Density}} \times \left( C_{\text{calibrators}} \times \frac{I_{\text{measurand}}}{I_{\text{calibrators}}} + b \pm U \right)$$

Where,

$I$  is the instrument response

$C$  is the concentration

$b$  is a bias

$U$  is the expanded uncertainty

Each of these influences on the measuring process will have uncertainty components that will be considered.

#### ***Step 2: Identify uncertainty components***

List of uncertainty components considered:

- Staff
  - o Multiple analysts
  - o Training
  - o Experience
- Calibrators
  - o Certified reference standards - uncertainty of the stated reference value
- Quality Control Samples
  - o Certified reference standards – same source; uncertainty of the stated reference value
  - o Not pre-diluted like beverage samples
- Sampling of Measurand

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- Homogenization – mixing prior to sampling
- Temperature – all calibrators, quality control samples, and the measurand are brought to room temperature
  - Variation in the time allowed to reach room temperature
  - Variation in room temperature at different times of year
- Internal Standard Preparation
  - Components:
    - n-propanol
  - Concentration
- Preparation of Aliquots of Calibrators, Quality Control Samples, and Measurand
  - Dilutor/Dispensers (preliminary beverage dilution and blood alcohol preparation)
    - Variation in which one used
    - Volume of sample and volume of diluent
      - Calibration uncertainty or pre-defined criteria for check of calibration status
    - Variation in use by multiple staff
  - Headspace vials:
    - Crimping
    - Material of stopper
    - Time between dispensing into and sealing vials
  - Time between replicate sampling of measurand
- Calibration of measuring system
  - Uncertainty in the calibrator values
  - Instrument precision
- Analysis
  - Instrument parameter settings
  - Variation in chromatograph used
  - Interference from matrix
  - Interference from reagents
  - Interference from other compounds
  - Stability of sample(s) from preparation through analysis
- Data Processing
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### ***Step 3: Quantify uncertainty components***

The laboratory has existing data from the measurement process. Beverage pre-dilution using a dilutor/dispenser was verified using a known alcoholic beverage sample. Results from this verification will be used to evaluate bias along with the certified reference standards data.

The calibration model was determined during method validation and was shown through the use of residual plots to have equal variance across the linear range. The residual plots are located in an excel document titled “Uncertainty Budget” and included at the end of this report. Therefore, the laboratory is going to calculate an estimation of measurement uncertainty for the entire reportable concentration range.

Each analytical run includes the duplicate analysis of each quality control sample (0.025 and 0.300 g/100mL aqueous certified reference standards and a blood matrix control) near the beginning and end of the sample sequence. All analysts have made measurements using this method over the time span of greater than one year using both gas chromatographs and two of the three diluter/dispensers.

The same batch of internal standard is used for all samples in an analytical batch. This leaves variation in the amount of internal standard added to each calibrator, quality control sample, and measurand sample by the pipette dilutor as the only aspect of the internal standard that has an influence on the measurement result.

The table below lists each uncertainty component considered and how it will be evaluated.

Uncertainty Component	Method of Evaluation
Staff	
Multiple Analysts	Type A - QC reproducibility data
Training	Type A -QC reproducibility data
Experience	Type A - QC reproducibility data
Calibrators	
Uncertainty in stated reference value	Type B - Certificate of Analysis
Quality Control Samples	
Certified Reference Standards	Bias Evaluation, QC reproducibility data
Not pre-diluted	Type B –Dilutor Calibration Certificates

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Sampling of Measurand	
Homogenization	Type B - Replicate agreement requirement
Temperature	Type A -QC reproducibility data Type B - Replicate agreement requirement
Internal Standard Preparation	
Components	No influence
Concentration of Internal Standard	No influence
Internal Standard Preparation	
Components	No influence
Concentration of Internal Standard	No influence
Preparation of aliquots	
Pipette Dilutor	Type A -QC reproducibility data (for blood alcohol dilutor, QC is sampled at the beginning and end of each batch and not all at one time) Type B – Dilutor Calibration Certificates (for beverage pre-dilution)
Variation in use by multiple staff	Type A -QC reproducibility data
Headspace vial	Type A -QC reproducibility data
Time between replicate sampling	Type B - Replicate agreement requirement

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Calibration of Measuring System	
Uncertainty in the calibrator values	Covered in Calibrators section
Matrix of calibrators and measurand	Covered in Calibrators section
Instrument precision	Type A -QC reproducibility data
Analysis	
Instrument parameters	Type A -QC reproducibility data
Variation in chromatograph used	Type A -QC reproducibility data
Interference from matrix	Covered in Sampling of Measurand section
Interference from reagents	Quality control - blank analysis
Interference from other compounds	Quality control - mixed volatiles analysis
Stability of samples	Type A -QC reproducibility data Type B - Replicate agreement requirement
Data Processing	
Calibration model	Type A -QC reproducibility data
Integration parameters	Type A -QC reproducibility data
Processing algorithms	Type A -QC reproducibility data

### Type A – QC reproducibility data

Over one year of data has been collected from the analysis of 0.025 g/100mL and 0.300 g/100mL aqueous certified reference standards. The percent relative standard deviation was calculated for both levels. The results of these calculations are:

$$\%RSD\ (0.025) = \pm 1.8133\%$$

$$\%RSD\ (0.300) = \pm 0.92486\%$$

Because the 0.025 level had the higher %RSD, it will be used during the following measurement uncertainty calculations.

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## Forensic Alcohol Estimate of the Uncertainty of Measurement

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Beverage Ethanol

Calculations performed:

Mean of data

$$\bar{x} = \frac{1}{n} \sum_{i=1}^n x_i$$

Standard deviation

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n - 1}}$$

Percent relative standard deviation

$$\%RSD = 100 \times \frac{s}{\bar{x}}$$

Type B – Replicate agreement requirement:

The laboratory procedure requires that two samples be taken from the homogenized measurand and the ethanol concentration of the two aliquots be within  $\pm 5\%$  of the average or the analysis is repeated.

Replicate Agreement = 5%

Type B – Certificate of Analysis

All certificates of analysis for certified reference standards used for calibrators and aqueous controls report a relative standard uncertainty of the listed concentration of:

Relative Standard Uncertainty =  $\pm 0.175\%$

Type B – Dilutor Calibration (from Hamilton calibration)

The lowest percentage stroke used during the beverage pre-dilution is 50%. The highest percentage stroke tested when the dilutor is calibrated is 30% for both right and left syringe drives. The precision passing criteria for calibration at the 30% stroke is a

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Beverage Ethanol

coefficient of variation of less than or equal to 0.200%. This %CV will be used for the right and left dilutor syringes used during the preliminary beverage dilution.

$$\%CV_{Left} = 0.2\%$$

$$\%CV_{right} = 0.2\%$$

### ***Step 4: Convert quantities to standard uncertainties***

#### Type A – QC reproducibility data

When analyzing case samples, two measurements are made of the measurand and the average truncated to 3 decimal places is reported. In the same fashion, the relative standard deviation calculated from the 0.025 aqueous QC reproducibility data is based on the average of duplicate measurements of quality control samples truncated to 3 decimal places. The relative standard deviation of the 0.025 aqueous QC reproducibility data will be used without further calculations.

$$\%RSD = \pm 1.8133\%$$

#### Type B – Replicate agreement requirement:

This component is evaluated as a rectangular distribution to determine its standard uncertainty.

$$\text{Standard Uncertainty} = \frac{5\%}{\sqrt{3}}$$

$$\text{Standard Uncertainty} = \pm 2.8868\%$$

#### Type B – Certificate of Analysis

The certificates of analysis for certified reference standards used already report standard uncertainties. No conversions are needed.

$$\text{Relative Standard Uncertainty} = \pm 0.175\%$$

#### Type B – Dilutor Calibration

This component is evaluated as a rectangular distribution to determine its standard uncertainty.

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## Forensic Alcohol Estimate of the Uncertainty of Measurement

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$$\text{Standard Uncertainty} = \frac{0.2\%}{\sqrt{3}}$$

$$\text{Standard Uncertainty (left)} = 0.11547\%$$

$$\text{Standard Uncertainty (right)} = 0.11547\%$$

### **Step 5: Calculate the combined standard uncertainty**

The Root Sum of the Squares formula will be used to calculate the combined uncertainty.

$$\text{Cmb. Std. Unc.} = \sqrt{\%RSD^2 + \text{Std Unc}_{\text{reps}}^2 + \text{Std Unc}_{\text{stds cals}}^2 + \text{Std Unc}_{\text{left}}^2 + \text{Std Unc}_{\text{right}}^2}$$

$$\text{Combined Standard Uncertainty} = \pm 3.4174\%$$

### **Step 5: Calculate the combined uncertainty continued – evaluation of bias**

Bias will be evaluated by comparing the calculated %bias from the low (0.025 g/100mL) and high (0.300 g/100mL) certified reference standard controls and the beverage dilutor verification data to the expanded combined standard uncertainty ( $k=2$ ). Any observed bias will be viewed as insignificant by the laboratory if:

$$\%bias < 2 \times \text{Combined Standard Uncertainty}$$

where,

$$\%bias = 100 \times \frac{\bar{x}_{\text{lab}} - x_{\text{ref}}}{x_{\text{ref}}}$$

Duplicate measurements of the certified reference standard controls, truncated to 4 decimal places were averaged and the result was truncated to 3 decimal places. The mean of these averages for a specific control was then compared to the control's target value to evaluate bias in the method. The results of these %bias calculations for each control were:

$$\%bias_{0.025} = + 0.2\%$$

$$\%bias_{0.300} = + 1.0\%$$

$$\%bias_{\text{dilutor verification}} = + 1.7\%$$

Compared to the expanded combined standard uncertainty of:

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## Forensic Alcohol Estimate of the Uncertainty of Measurement

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Expanded Combined Standard Uncertainty =  $\pm 6.8348\%$

these biases are considered insignificant. However, the uncertainty in the reference values of these controls will be added to the combined standard uncertainty.

Cmb. Std. Unc.

$$= \sqrt{\%RSD^2 + Std\ Unc_{reps}^2 + Std\ Unc_{stds\ cals}^2 + Std\ Unc_{left}^2 + Std\ Unc_{right}^2 + Std\ Unc_{stds\ ctrls}^2}$$

Combined Standard Uncertainty =  $\pm 3.4219\%$

### ***Step 6: Expand the combined standard uncertainty by coverage factor (k)***

The combined standard uncertainty will be expanded to a 95% coverage probability (coverage factor k = 2):

Expanded Combined Standard Uncertainty (k=2) =  $\pm 6.8438\%$

### ***Step 7: Evaluate the expanded uncertainty***

Upon review of the combined standard uncertainty components, it was determined that the administrative requirement of replicate measurements being within  $\pm 5\%$  of the average was the largest contributor to overall measurement uncertainty. Changing the administrative replicate agreement requirement from 5% to 3% (as decided in this step of the blood ethanol uncertainty report ) affects the measurement uncertainty as follows:

Type B – Replicate agreement requirement:

$$\text{Standard Uncertainty} = \frac{3\%}{\sqrt{3}}$$

Standard Uncertainty =  $\pm 1.7321\%$

Combined standard uncertainty (not including control standard uncertainty):

Combined Standard Uncertainty =  $\pm 2.5190\%$

Expanded combined standard uncertainty (k=2, not including control standard uncertainty):

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Expanded Combined Standard Uncertainty =  $\pm 5.0380\%$

Bias is still considered insignificant when compared to the updated expanded combined standard uncertainty.

Expanded combined standard uncertainty ( $k=2$ , including control standard uncertainty):

Expanded Combined Standard Uncertainty =  $\pm 5.0501\%$

Effective with reporting measurement uncertainty (December 20, 2013) the administrative requirement for replicate agreement has been changed to 3% and a revised manual issued.

The laboratory has decided to perform periodic internal checks between the annual external checks to continually ensure proper functioning of the equipment. This procedure requires the use of a calibrated balance (by an external ISO/IEC 17025:2005 accredited vendor) and specifies that if the diluter/dispenser does not pass a check, then the equipment will be removed from use and a calibration by the accredited calibration service provider will be obtained.

The laboratory also has a procedure to check the calibration status and to ensure the proper functioning of the balances used in the diluter/dispenser procedure to ensure proper functioning. The laboratory uses calibrated mass reference standards with established measurement traceability to perform intermediate checks of the calibration status of the balances.

A requirement to perform an internal check of the diluter/dispensers within 5-6 months of the external calibration is effective with a revised manual issued December 20, 2013.

### ***Step 8: Report the uncertainty***

The expanded combined standard uncertainty rounded to 2 significant figures is:

Expanded Combined Standard Uncertainty =  $\pm 5.1\%$

The measurement result and the expanded uncertainty will be reported in the same units. The coverage probability used to expand the uncertainty will also be reported. A table showing the measurement uncertainty for a representative range of reported beverage ethanol results is included at the end of this report.

N=	130	Mean=	0.0251	SD=	0.0005	SD*2=	0.0009	%RSD=	1.8133	%RSD*2	3.6	%Bias	0.2
Date	Anaylst	Instrument	Pipetter	Lot	Value		Reported						
6/28/2012	CRF	HS2	Wilma	FN032210-01	0.0250								
6/28/2012	CRF	HS2	Wilma	FN032210-01	0.0257	0.025							
6/28/2012	CRF	HS2	Wilma	FN032210-01	0.0253								
6/28/2012	CRF	HS2	Wilma	FN032210-01	0.0256	0.025							
6/29/2012	bmb	HS2	Wilma	FN032210-01	0.0257								
6/29/2012	bmb	HS2	Wilma	FN032210-01	0.0257	0.025							
6/29/2012	bmb	HS2	Wilma	FN032210-01	0.0255								
6/29/2012	bmb	HS2	Wilma	FN032210-01	0.0259	0.025							
7/3/2012	CRF	HS2	Wilma	FN032210-01	0.0254								
7/3/2012	CRF	HS2	Wilma	FN032210-01	0.0254	0.025							
7/3/2012	CRF	HS2	Wilma	FN032210-01	0.0249								
7/3/2012	CRF	HS2	Wilma	FN032210-01	0.0255	0.025							
7/9/2012	bmb	HS2	Wilma	FN032210-01	0.0250								
7/9/2012	bmb	HS2	Wilma	FN032210-01	0.0254	0.025							
7/9/2012	bmb	HS2	Wilma	FN032210-01	0.0250								
7/9/2012	bmb	HS2	Wilma	FN032210-01	0.0254	0.025							
7/9/2012	bmb	HS2	Wilma	FN032210-01	0.0250								
7/9/2012	bmb	HS2	Wilma	FN032210-01	0.0254	0.025							
7/10/2012	COB	HS2	Wilma	FN032210-01	0.0251								
7/10/2012	COB	HS2	Wilma	FN032210-01	0.0253	0.025							
7/10/2012	COB	HS2	Wilma	FN032210-01	0.0260								
7/10/2012	COB	HS2	Wilma	FN032210-01	0.0261	0.026							
7/11/2012	CRF	HS2	Wilma	FN032210-01	0.0257								
7/11/2012	CRF	HS2	Wilma	FN032210-01	0.0261	0.025							
7/11/2012	CRF	HS2	Wilma	FN032210-01	0.0259								
7/11/2012	CRF	HS2	Wilma	FN032210-01	0.0261	0.026							
7/16/2012	bmb	HS2	Wilma	FN032210-01	0.0257								
7/16/2012	bmb	HS2	Wilma	FN032210-01	0.0258	0.025							
7/16/2012	bmb	HS2	Wilma	FN032210-01	0.0258	0.025							
7/16/2012	bmb	HS2	Wilma	FN032210-01	0.0260								
7/16/2012	bmb	HS2	Wilma	FN032210-01	0.0260	0.026							
7/18/2012	COB	HS2	Wilma	FN032210-01	0.0252								
7/18/2012	COB	HS2	Wilma	FN032210-01	0.0255	0.025							
7/18/2012	COB	HS2	Wilma	FN032210-01	0.0255								
7/18/2012	COB	HS2	Wilma	FN032210-01	0.0260	0.025							
7/26/2012	CRF	HS2	Wilma	FN032210-01	0.0258								
7/26/2012	CRF	HS2	Wilma	FN032210-01	0.0256	0.025							
7/26/2012	CRF	HS2	Wilma	FN032210-01	0.0256								
7/26/2012	CRF	HS2	Wilma	FN032210-01	0.0260	0.025							
7/30/2012	COB	HS2	Wilma	FN032210-01	0.0244								
7/30/2012	COB	HS2	Wilma	FN032210-01	0.0242	0.024							
7/30/2012	COB	HS2	Wilma	FN032210-01	0.0238								
7/30/2012	COB	HS2	Wilma	FN032210-01	0.0245	0.024							
8/2/2012	COB	HS2	Wilma	FN032210-01	0.0254								
8/2/2012	COB	HS2	Wilma	FN032210-01	0.0254	0.025							
8/2/2012	COB	HS2	Wilma	FN032210-01	0.0259								
8/2/2012	COB	HS2	Wilma	FN032210-01	0.0257	0.025							
8/9/2012	bmb	HS2	Wilma	FN032210-01	0.0244								
8/9/2012	bmb	HS2	Wilma	FN032210-01	0.0250	0.024							
8/9/2012	bmb	HS2	Wilma	FN032210-01	0.0249								
8/9/2012	bmb	HS2	Wilma	FN032210-01	0.0242	0.024							
8/13/2012	CRF	HS2	Wilma	FN032210-01	0.0254								
8/13/2012	CRF	HS2	Wilma	FN032210-01	0.0254	0.025							
8/13/2012	CRF	HS2	Wilma	FN032210-01	0.0249								
8/13/2012	CRF	HS2	Wilma	FN032210-01	0.0255								
8/16/2012	CRF	HS2	Wilma	FN032210-01	0.0255								
8/16/2012	CRF	HS2	Wilma	FN032210-01	0.0260	0.025							
8/16/2012	CRF	HS2	Wilma	FN032210-01	0.0256								
8/16/2012	CRF	HS2	Wilma	FN032210-01	0.0262	0.025							
8/22/2012	COB	HS2	Wilma	FN032210-01	0.0253								
8/22/2012	COB	HS2	Wilma	FN032210-01	0.0251	0.025							
8/22/2012	COB	HS2	Wilma	FN032210-01	0.0248								
8/22/2012	COB	HS2	Wilma	FN032210-01	0.0251	0.024							
9/7/2012	COB	HS2	Wilma	FN032210-01	0.0252								
9/7/2012	COB	HS2	Wilma	FN032210-01	0.0256	0.025							
9/7/2012	COB	HS2	Wilma	FN032210-01	0.0251								
9/7/2012	COB	HS2	Wilma	FN032210-01	0.0250	0.025							
9/12/2012	bmb	HS2	Wilma	FN032210-01	0.0246								
9/12/2012	bmb	HS2	Wilma	FN032210-01	0.0246	0.024							
9/12/2012	bmb	HS2	Wilma	FN032210-01	0.0246								
9/12/2012	bmb	HS2	Wilma	FN032210-01	0.0249	0.024							
9/17/2012	CRF	HS2	Wilma	FN032210-01	0.0255								

9/17/2012	CRF	HS2	Wilma	FN032210-01	0.0257	0.025
9/17/2012	CRF	HS2	Wilma	FN032210-01	0.0259	
9/17/2012	CRF	HS2	Wilma	FN032210-01	0.0255	0.025
9/25/2012	COB	HS2	Wilma	FN032210-01	0.0241	
9/25/2012	COB	HS2	Wilma	FN032210-01	0.0251	0.024
9/25/2012	COB	HS2	Wilma	FN032210-01	0.0247	
9/25/2012	COB	HS2	Wilma	FN032210-01	0.0246	0.024
10/5/2012	COB	HS2	Wilma	FN032210-01	0.0257	
10/5/2012	COB	HS2	Wilma	FN032210-01	0.0261	0.025
10/5/2012	COB	HS2	Wilma	FN032210-01	0.0263	
10/5/2012	COB	HS2	Wilma	FN032210-01	0.0270	0.026
10/15/2012	CRF	HS2	Wilma	FN032210-01	0.0253	
10/15/2012	CRF	HS2	Wilma	FN032210-01	0.0256	0.025
10/15/2012	CRF	HS2	Wilma	FN032210-01	0.0254	
10/15/2012	CRF	HS2	Wilma	FN032210-01	0.0253	0.025
10/17/2012	bmb	HS2	Wilma	FN032210-01	0.0251	
10/17/2012	bmb	HS2	Wilma	FN032210-01	0.0250	0.025
10/17/2012	bmb	HS2	Wilma	FN032210-01	0.0248	
10/17/2012	bmb	HS2	Wilma	FN032210-01	0.0255	0.025
10/19/2012	CRF	HS2	Wilma	FN032210-01	0.0255	
10/19/2012	CRF	HS2	Wilma	FN032210-01	0.0258	0.025
10/19/2012	CRF	HS2	Wilma	FN032210-01	0.0256	
10/19/2012	CRF	HS2	Wilma	FN032210-01	0.0261	0.025
10/23/2012	COB	HS2	Wilma	FN032210-01	0.0258	
10/23/2012	COB	HS2	Wilma	FN032210-01	0.0259	0.025
10/23/2012	COB	HS2	Wilma	FN032210-01	0.0258	
10/23/2012	COB	HS2	Wilma	FN032210-01	0.0257	0.025
11/2/2012	bmb	HS2	ML600-1	FN032210-01	0.0251	
11/2/2012	bmb	HS2	ML600-1	FN032210-01	0.0258	0.025
11/2/2012	bmb	HS2	ML600-1	FN032210-01	0.0252	
11/2/2012	bmb	HS2	ML600-1	FN032210-01	0.0256	0.025
11/6/2012	CRF	HS2	ML600-1	FN032210-01	0.0250	
11/6/2012	CRF	HS2	ML600-1	FN032210-01	0.0252	0.025
11/6/2012	CRF	HS2	ML600-1	FN032210-01	0.0250	
11/6/2012	CRF	HS2	ML600-1	FN032210-01	0.0255	0.025
11/16/2012	COB	HS2	ML600-1	FN032210-01	0.0259	
11/16/2012	COB	HS2	ML600-1	FN032210-01	0.0257	0.025
11/16/2012	COB	HS2	ML600-1	FN032210-01	0.0255	
11/16/2012	COB	HS2	ML600-1	FN032210-01	0.0261	0.025
11/16/2012	bmb	HS2	ML600-1	FN032210-01	0.0257	
11/16/2012	bmb	HS2	ML600-1	FN032210-01	0.0259	0.025
11/16/2012	bmb	HS2	ML600-1	FN032210-01	0.0256	
11/16/2012	bmb	HS2	ML600-1	FN032210-01	0.0258	0.025
11/20/2012	CRF	HS2	ML600-1	FN032210-01	0.0256	
11/20/2012	CRF	HS2	ML600-1	FN032210-01	0.0256	0.025
11/20/2012	CRF	HS2	ML600-1	FN032210-01	0.0258	
11/20/2012	CRF	HS2	ML600-1	FN032210-01	0.0261	0.025
11/28/2012	COB	HS2	ML600-1	FN032210-01	0.0249	
11/28/2012	COB	HS2	ML600-1	FN032210-01	0.0252	0.025
11/28/2012	COB	HS2	ML600-1	FN032210-01	0.0247	
11/28/2012	COB	HS2	ML600-1	FN032210-01	0.0254	0.025
12/3/2012	CRF	HS1	ML600-1	FN032210-01	0.0252	
12/3/2012	CRF	HS1	ML600-1	FN032210-01	0.0256	0.025
12/3/2012	CRF	HS1	ML600-1	FN032210-01	0.0253	
12/3/2012	CRF	HS1	ML600-1	FN032210-01	0.0255	0.025
12/13/2012	bmb	HS2	ML600-1	FN032210-01	0.0251	
12/13/2012	bmb	HS2	ML600-1	FN032210-01	0.0251	0.025
12/13/2012	bmb	HS2	ML600-1	FN032210-01	0.0256	
12/13/2012	bmb	HS2	ML600-1	FN032210-01	0.0254	0.025
12/21/2012	COB	HS2	ML600-1	FN032210-01	0.0252	
12/21/2012	COB	HS2	ML600-1	FN032210-01	0.0249	0.025
12/21/2012	COB	HS2	ML600-1	FN032210-01	0.0254	
12/21/2012	COB	HS2	ML600-1	FN032210-01	0.0254	0.025
12/26/2012	CRF	HS1	ML600-1	FN032210-01	0.0254	
12/26/2012	CRF	HS1	ML600-1	FN032210-01	0.0251	0.025
12/26/2012	CRF	HS1	ML600-1	FN032210-01	0.0255	
12/26/2012	CRF	HS1	ML600-1	FN032210-01	0.0255	0.025
1/14/2013	COB	HS2	ML600-1	FN032210-01	0.0249	
1/14/2013	COB	HS2	ML600-1	FN032210-01	0.0255	0.025
1/14/2013	COB	HS2	ML600-1	FN032210-01	0.0253	
1/14/2013	COB	HS2	ML600-1	FN032210-01	0.0255	0.025

1/24/2013	bmb	HS2	ML600-1	FN032210-01	0.0249	
1/24/2013	bmb	HS2	ML600-1	FN032210-01	0.0252	0.025
1/24/2013	bmb	HS2	ML600-1	FN032210-01	0.0252	
1/24/2013	bmb	HS2	ML600-1	FN032210-01	0.0254	0.025
1/28/2013	CRF	HS1	ML600-1	FN032210-01	0.0251	
1/28/2013	CRF	HS1	ML600-1	FN032210-01	0.0256	0.025
1/28/2013	CRF	HS1	ML600-1	FN032210-01	0.0257	
1/28/2013	CRF	HS1	ML600-1	FN032210-01	0.0260	0.025
2/6/2013	COB	HS1	ML600-1	FN032210-01	0.0261	
2/6/2013	COB	HS1	ML600-1	FN032210-01	0.0261	0.026
2/6/2013	COB	HS1	ML600-1	FN032210-01	0.0260	
2/6/2013	COB	HS1	ML600-1	FN032210-01	0.0265	0.026
2/12/2013	COB	HS2	ML600-1	FN032210-01	0.0253	
2/12/2013	COB	HS2	ML600-1	FN032210-01	0.0253	0.025
2/12/2013	COB	HS2	ML600-1	FN032210-01	0.0257	
2/12/2013	COB	HS2	ML600-1	FN032210-01	0.0256	0.025
2/25/2013	bmb	HS2	ML600-1	FN032210-01	0.0251	
2/25/2013	bmb	HS2	ML600-1	FN032210-01	0.0255	0.025
2/25/2013	bmb	HS2	ML600-1	FN032210-01	0.0255	
2/25/2013	bmb	HS2	ML600-1	FN032210-01	0.0258	0.025
3/7/2013	CRF	HS1	ML600-1	FN032210-01	0.0257	
3/7/2013	CRF	HS1	ML600-1	FN032210-01	0.0254	0.025
3/7/2013	CRF	HS1	ML600-1	FN032210-01	0.0254	
3/7/2013	CRF	HS1	ML600-1	FN032210-01	0.0254	0.025
3/12/2013	COB	HS2	ML600-1	FN032210-01	0.0253	
3/12/2013	COB	HS2	ML600-1	FN032210-01	0.0255	
3/12/2013	COB	HS2	ML600-1	FN032210-01	0.0255	0.025
3/12/2013	COB	HS2	ML600-1	FN032210-01	0.0257	
3/12/2013	COB	HS2	ML600-1	FN032210-01	0.0253	0.025
3/26/2013	CRF	HS1	ML600-1	FN032210-01	0.0253	
3/26/2013	CRF	HS1	ML600-1	FN032210-01	0.0255	0.025
3/26/2013	CRF	HS1	ML600-1	FN032210-01	0.0255	
3/26/2013	CRF	HS1	ML600-1	FN032210-01	0.0255	0.025
4/2/2013	bmb	HS2	Wilma	FN032210-01	0.0259	
4/2/2013	bmb	HS2	Wilma	FN032210-01	0.0260	0.025
4/2/2013	bmb	HS2	Wilma	FN032210-01	0.0256	
4/2/2013	bmb	HS2	Wilma	FN032210-01	0.0263	0.025
4/15/2013	CRF	HS2	Wilma	FN032210-01	0.0252	
4/15/2013	CRF	HS2	Wilma	FN032210-01	0.0258	0.025
4/15/2013	CRF	HS2	Wilma	FN032210-01	0.0257	
4/15/2013	CRF	HS2	Wilma	FN032210-01	0.0259	0.025
4/25/2013	COB	HS1	Wilma	FN081712-01	0.0258	
4/25/2013	COB	HS1	Wilma	FN081712-01	0.0262	
4/25/2013	COB	HS1	Wilma	FN081712-01	0.0264	0.026
4/30/2013	bmb	HS2	Wilma	FN081712-01	0.0260	
4/30/2013	bmb	HS2	Wilma	FN081712-01	0.0261	0.026
4/30/2013	bmb	HS2	Wilma	FN081712-01	0.0263	
4/30/2013	bmb	HS2	Wilma	FN081712-01	0.0264	0.026
5/7/2013	COB	HS1	Wilma	FN081712-01	0.0256	
5/7/2013	COB	HS1	Wilma	FN081712-01	0.0257	0.025
5/7/2013	COB	HS1	Wilma	FN081712-01	0.0255	
5/7/2013	COB	HS1	Wilma	FN081712-01	0.0259	0.025
5/14/2013	CRF	HS2	Wilma	FN081712-01	0.0261	
5/14/2013	CRF	HS2	Wilma	FN081712-01	0.0264	0.026
5/14/2013	CRF	HS2	Wilma	FN081712-01	0.0263	
5/14/2013	CRF	HS2	Wilma	FN081712-01	0.0266	0.026
5/31/2013	bmb	HS2	Wilma	FN081712-01	0.0259	
5/31/2013	bmb	HS2	Wilma	FN081712-01	0.0264	0.026
5/31/2013	bmb	HS2	Wilma	FN081712-01	0.0263	
5/31/2013	bmb	HS2	Wilma	FN081712-01	0.0261	0.026
6/7/2013	CRF	HS1	Wilma	FN081712-01	0.0254	
6/7/2013	CRF	HS1	Wilma	FN081712-01	0.0255	0.025
6/7/2013	CRF	HS1	Wilma	FN081712-01	0.0256	
6/7/2013	CRF	HS1	Wilma	FN081712-01	0.0257	0.025
6/19/2013	bmb	HS2	Wilma	FN081712-01	0.0256	
6/19/2013	bmb	HS2	Wilma	FN081712-01	0.0257	0.025
6/19/2013	bmb	HS2	Wilma	FN081712-01	0.0258	
6/19/2013	bmb	HS2	Wilma	FN081712-01	0.0261	0.025
6/27/2013	CRF	HS1	Wilma	FN081712-01	0.0250	
6/27/2013	CRF	HS1	Wilma	FN081712-01	0.0251	0.025
6/27/2013	CRF	HS1	Wilma	FN081712-01	0.0254	

6/27/2013	CRF	HS1	Wilma	FN081712-01	0.0253	0.025
7/3/2013	bmb	HS1	Wilma	FN081712-01	0.0251	
7/3/2013	bmb	HS1	Wilma	FN081712-01	0.0255	0.025
7/3/2013	bmb	HS1	Wilma	FN081712-01	0.0255	
7/3/2013	bmb	HS1	Wilma	FN081712-01	0.0254	0.025
7/12/2013	CRF	HS2	Wilma	FN081712-01	0.0254	
7/12/2013	CRF	HS2	Wilma	FN081712-01	0.0258	0.025
7/12/2013	CRF	HS2	Wilma	FN081712-01	0.0257	
7/12/2013	CRF	HS2	Wilma	FN081712-01	0.0259	0.025
7/12/2013	bmb	HS1	Wilma	FN081712-01	0.0253	
7/12/2013	bmb	HS1	Wilma	FN081712-01	0.0254	0.025
7/12/2013	bmb	HS1	Wilma	FN081712-01	0.0254	
7/12/2013	bmb	HS1	Wilma	FN081712-01	0.0252	0.025
7/25/2013	COB	HS2	Wilma	FN081712-01	0.0260	
7/25/2013	COB	HS2	Wilma	FN081712-01	0.0257	0.025
7/25/2013	COB	HS2	Wilma	FN081712-01	0.0259	
7/25/2013	COB	HS2	Wilma	FN081712-01	0.0262	0.026
8/14/2013	CRF	HS1	Wilma	FN081712-01	0.0255	
8/14/2013	CRF	HS1	Wilma	FN081712-01	0.0254	0.025
8/14/2013	CRF	HS1	Wilma	FN081712-01	0.0254	
8/14/2013	CRF	HS1	Wilma	FN081712-01	0.0258	0.025
8/19/2013	bmb	HS1	Wilma	FN081712-01	0.0255	
8/19/2013	bmb	HS1	Wilma	FN081712-01	0.0257	0.025
8/19/2013	bmb	HS1	Wilma	FN081712-01	0.0258	
8/19/2013	bmb	HS1	Wilma	FN081712-01	0.0258	0.025
8/20/2013	COB	HS2	Wilma	FN081712-01	0.0249	
8/20/2013	COB	HS2	Wilma	FN081712-01	0.0250	0.024
8/20/2013	COB	HS2	Wilma	FN081712-01	0.0249	
8/20/2013	COB	HS2	Wilma	FN081712-01	0.0253	0.025
8/30/2013	COB	HS2	Wilma	FN081712-01	0.0257	
8/30/2013	COB	HS2	Wilma	FN081712-01	0.0258	0.025
8/30/2013	COB	HS2	Wilma	FN081712-01	0.0256	
8/30/2013	COB	HS2	Wilma	FN081712-01	0.0259	0.025
9/20/2013	bmb	HS2	Wilma	FN081712-01	0.0251	
9/20/2013	bmb	HS2	Wilma	FN081712-01	0.0258	0.025
9/20/2013	bmb	HS2	Wilma	FN081712-01	0.0259	
9/20/2013	bmb	HS2	Wilma	FN081712-01	0.0256	0.025
9/23/2013	CRF	HS1	Wilma	FN081712-01	0.0261	
9/23/2013	CRF	HS1	Wilma	FN081712-01	0.0259	0.026
9/23/2013	CRF	HS1	Wilma	FN081712-01	0.0261	
9/23/2013	CRF	HS1	Wilma	FN081712-01	0.0259	0.026
9/26/2013	COB	HS1	Wilma	FN081712-01	0.0256	
9/26/2013	COB	HS1	Wilma	FN081712-01	0.0262	0.025
9/26/2013	COB	HS1	Wilma	FN081712-01	0.0262	
9/26/2013	COB	HS1	Wilma	FN081712-01	0.0263	0.026
10/11/2013	CRF	HS2	Wilma	FN081712-01	0.0258	
10/11/2013	CRF	HS2	Wilma	FN081712-01	0.0258	0.025
10/11/2013	CRF	HS2	Wilma	FN081712-01	0.0254	
10/11/2013	CRF	HS2	Wilma	FN081712-01	0.0261	0.025

N=	130	Mean=	0.3031	SD=	0.0028	SD*2=	0.0056	%RSD=	0.92486	%RSD*2	1.8	%Bias	1.0
Date	Anaylst	Instrument	Pipettor	Lot	Value	Reported							
6/28/2012	CRF	HS2	Wilma	FN121510-01	0.2998								
6/28/2012	CRF	HS2	Wilma	FN121510-01	0.3002	0.300							
6/28/2012	CRF	HS2	Wilma	FN121510-01	0.3011								
6/28/2012	CRF	HS2	Wilma	FN121510-01	0.3026	0.301							
7/3/2012	CRF	HS2	Wilma	FN121510-01	0.3011								
7/3/2012	CRF	HS2	Wilma	FN121510-01	0.3000	0.300							
7/3/2012	CRF	HS2	Wilma	FN121510-01	0.3040								
7/3/2012	CRF	HS2	Wilma	FN121510-01	0.3050	0.304							
7/9/2012	bmb	HS2	Wilma	FN121510-01	0.3022								
7/9/2012	bmb	HS2	Wilma	FN121510-01	0.3013	0.301							
7/9/2012	bmb	HS2	Wilma	FN121510-01	0.3053								
7/9/2012	bmb	HS2	Wilma	FN121510-01	0.3037	0.304							
7/10/2012	COB	HS2	Wilma	FN121510-01	0.3017								
7/10/2012	COB	HS2	Wilma	FN121510-01	0.3002	0.300							
7/10/2012	COB	HS2	Wilma	FN121510-01	0.3060								
7/10/2012	COB	HS2	Wilma	FN121510-01	0.3048	0.305							
7/11/2012	CRF	HS2	Wilma	FN121510-01	0.3016								
7/11/2012	CRF	HS2	Wilma	FN121510-01	0.3035	0.302							
7/11/2012	CRF	HS2	Wilma	FN121510-01	0.3042								
7/11/2012	CRF	HS2	Wilma	FN121510-01	0.3050	0.304							
7/16/2012	bmb	HS2	Wilma	FN121510-01	0.3021								
7/16/2012	bmb	HS2	Wilma	FN121510-01	0.3007	0.301							
7/16/2012	bmb	HS2	Wilma	FN121510-01	0.2968								
7/16/2012	bmb	HS2	Wilma	FN121510-01	0.2983	0.297							
7/18/2012	COB	HS2	Wilma	FN121510-01	0.3014								
7/18/2012	COB	HS2	Wilma	FN121510-01	0.3015	0.301							
7/18/2012	COB	HS2	Wilma	FN121510-01	0.3055								
7/18/2012	COB	HS2	Wilma	FN121510-01	0.3057	0.305							
7/26/2012	CRF	HS2	Wilma	FN121510-01	0.3015								
7/26/2012	CRF	HS2	Wilma	FN121510-01	0.3009	0.301							
7/26/2012	CRF	HS2	Wilma	FN121510-01	0.3065								
7/26/2012	CRF	HS2	Wilma	FN121510-01	0.3050	0.305							
7/30/2012	COB	HS2	Wilma	FN121510-01	0.3060								
7/30/2012	COB	HS2	Wilma	FN121510-01	0.3043	0.305							
7/30/2012	COB	HS2	Wilma	FN121510-01	0.3033								
7/30/2012	COB	HS2	Wilma	FN121510-01	0.3039	0.303							
8/2/2012	COB	HS2	Wilma	FN121510-01	0.3003								
8/2/2012	COB	HS2	Wilma	FN121510-01	0.3000	0.300							
8/2/2012	COB	HS2	Wilma	FN121510-01	0.2993								
8/2/2012	COB	HS2	Wilma	FN121510-01	0.2992	0.299							
8/9/2012	bmb	HS2	Wilma	FN121510-01	0.2991								
8/9/2012	bmb	HS2	Wilma	FN121510-01	0.2997	0.299							
8/9/2012	bmb	HS2	Wilma	FN121510-01	0.2973								
8/9/2012	bmb	HS2	Wilma	FN121510-01	0.2989	0.298							
8/13/2012	CRF	HS2	Wilma	FN121510-01	0.2986								
8/13/2012	CRF	HS2	Wilma	FN121510-01	0.3019	0.300							
8/13/2012	CRF	HS2	Wilma	FN121510-01	0.3036								
8/13/2012	CRF	HS2	Wilma	FN121510-01	0.3035	0.303							
8/16/2012	CRF	HS2	Wilma	FN121510-01	0.3001								
8/16/2012	CRF	HS2	Wilma	FN121510-01	0.2995	0.299							
8/16/2012	CRF	HS2	Wilma	FN121510-01	0.3029								
8/16/2012	CRF	HS2	Wilma	FN121510-01	0.3023	0.302							
8/22/2012	COB	HS2	Wilma	FN121510-01	0.3018								
8/22/2012	COB	HS2	Wilma	FN121510-01	0.3010	0.301							
8/22/2012	COB	HS2	Wilma	FN121510-01	0.2965								
8/22/2012	COB	HS2	Wilma	FN121510-01	0.2962	0.296							
9/7/2012	COB	HS2	Wilma	FN121510-01	0.3030								
9/7/2012	COB	HS2	Wilma	FN121510-01	0.3012	0.302							
9/7/2012	COB	HS2	Wilma	FN121510-01	0.3032								
9/7/2012	COB	HS2	Wilma	FN121510-01	0.2996	0.301							
9/12/2012	bmb	HS2	Wilma	FN121510-01	0.3029								
9/12/2012	bmb	HS2	Wilma	FN121510-01	0.3026	0.302							
9/12/2012	bmb	HS2	Wilma	FN121510-01	0.3031								
9/12/2012	bmb	HS2	Wilma	FN121510-01	0.3023	0.302							
9/17/2012	CRF	HS2	Wilma	FN121510-01	0.3016								
9/17/2012	CRF	HS2	Wilma	FN121510-01	0.3029	0.302							
9/17/2012	CRF	HS2	Wilma	FN121510-01	0.3045								
9/17/2012	CRF	HS2	Wilma	FN121510-01	0.3060	0.305							
9/25/2012	COB	HS2	Wilma	FN121510-01	0.3008								

9/25/2012	COB	HS2	Wilma	FN121510-01	0.3023	0.301
9/25/2012	COB	HS2	Wilma	FN121510-01	0.3021	
9/25/2012	COB	HS2	Wilma	FN121510-01	0.2973	0.299
10/5/2012	COB	HS2	Wilma	FN121510-01	0.3013	
10/5/2012	COB	HS2	Wilma	FN121510-01	0.2998	0.300
10/5/2012	COB	HS2	Wilma	FN121510-01	0.3052	
10/5/2012	COB	HS2	Wilma	FN121510-01	0.3007	0.302
10/15/2012	CRF	HS2	Wilma	FN121510-01	0.3011	
10/15/2012	CRF	HS2	Wilma	FN121510-01	0.3007	0.300
10/15/2012	CRF	HS2	Wilma	FN121510-01	0.3018	
10/15/2012	CRF	HS2	Wilma	FN121510-01	0.3023	0.302
10/17/2012	bmb	HS2	Wilma	FN121510-01	0.3007	
10/17/2012	bmb	HS2	Wilma	FN121510-01	0.3012	0.300
10/17/2012	bmb	HS2	Wilma	FN121510-01	0.3029	
10/17/2012	bmb	HS2	Wilma	FN121510-01	0.3020	0.302
10/19/2012	CRF	HS2	Wilma	FN121510-01	0.3022	
10/19/2012	CRF	HS2	Wilma	FN121510-01	0.3027	0.302
10/19/2012	CRF	HS2	Wilma	FN121510-01	0.3064	
10/19/2012	CRF	HS2	Wilma	FN121510-01	0.3046	0.305
10/23/2012	COB	HS2	Wilma	FN121510-01	0.3007	
10/23/2012	COB	HS2	Wilma	FN121510-01	0.3019	0.301
10/23/2012	COB	HS2	Wilma	FN121510-01	0.3011	
10/23/2012	COB	HS2	Wilma	FN121510-01	0.3016	0.301
11/2/2012	bmb	HS2	ML600-1	FN121510-01	0.3032	
11/2/2012	bmb	HS2	ML600-1	FN121510-01	0.3009	0.302
11/2/2012	bmb	HS2	ML600-1	FN121510-01	0.3045	
11/2/2012	bmb	HS2	ML600-1	FN121510-01	0.3069	0.305
11/6/2012	CRF	HS2	ML600-1	FN121510-01	0.3027	
11/6/2012	CRF	HS2	ML600-1	FN121510-01	0.3012	0.301
11/6/2012	CRF	HS2	ML600-1	FN121510-01	0.3075	
11/6/2012	CRF	HS2	ML600-1	FN121510-01	0.3108	0.309
11/16/2012	COB	HS2	ML600-1	FN121510-01	0.3018	
11/16/2012	COB	HS2	ML600-1	FN121510-01	0.3023	0.302
11/16/2012	COB	HS2	ML600-1	FN121510-01	0.3057	
11/16/2012	COB	HS2	ML600-1	FN121510-01	0.3071	0.306
11/16/2012	bmb	HS2	ML600-1	FN121510-01	0.3011	
11/16/2012	bmb	HS2	ML600-1	FN121510-01	0.3018	0.301
11/16/2012	bmb	HS2	ML600-1	FN121510-01	0.3057	
11/16/2012	bmb	HS2	ML600-1	FN121510-01	0.3040	0.304
11/20/2012	CRF	HS2	ML600-1	FN121510-01	0.3020	
11/20/2012	CRF	HS2	ML600-1	FN121510-01	0.3025	0.302
11/20/2012	CRF	HS2	ML600-1	FN121510-01	0.3067	
11/20/2012	CRF	HS2	ML600-1	FN121510-01	0.3078	0.307
11/28/2012	COB	HS2	ML600-1	FN121510-01	0.3025	
11/28/2012	COB	HS2	ML600-1	FN121510-01	0.3021	0.302
11/28/2012	COB	HS2	ML600-1	FN121510-01	0.3021	
11/28/2012	COB	HS2	ML600-1	FN121510-01	0.3044	0.303
12/3/2012	CRF	HS1	ML600-1	FN121510-01	0.3022	
12/3/2012	CRF	HS1	ML600-1	FN121510-01	0.3021	0.302
12/3/2012	CRF	HS1	ML600-1	FN121510-01	0.3062	
12/3/2012	CRF	HS1	ML600-1	FN121510-01	0.3044	0.305
12/13/2012	bmb	HS2	ML600-1	FN121510-01	0.3007	
12/13/2012	bmb	HS2	ML600-1	FN121510-01	0.3020	0.301
12/13/2012	bmb	HS2	ML600-1	FN121510-01	0.3066	
12/13/2012	bmb	HS2	ML600-1	FN121510-01	0.3059	0.306
12/21/2012	COB	HS2	ML600-1	FN121510-01	0.3064	
12/21/2012	COB	HS2	ML600-1	FN121510-01	0.3053	0.305
12/21/2012	COB	HS2	ML600-1	FN121510-01	0.3097	
12/21/2012	COB	HS2	ML600-1	FN121510-01	0.3105	0.310
12/26/2012	CRF	HS1	ML600-1	FN121510-01	0.3025	
12/26/2012	CRF	HS1	ML600-1	FN121510-01	0.3017	0.302
12/26/2012	CRF	HS1	ML600-1	FN121510-01	0.3053	
12/26/2012	CRF	HS1	ML600-1	FN121510-01	0.3052	0.305
1/14/2013	COB	HS2	ML600-1	FN121510-01	0.3039	
1/14/2013	COB	HS2	ML600-1	FN121510-01	0.3055	0.304
1/14/2013	COB	HS2	ML600-1	FN121510-01	0.3085	
1/14/2013	COB	HS2	ML600-1	FN121510-01	0.3076	0.308
1/24/2013	bmb	HS2	ML600-1	FN121510-01	0.3025	
1/24/2013	bmb	HS2	ML600-1	FN121510-01	0.3021	0.302
1/24/2013	bmb	HS2	ML600-1	FN121510-01	0.3042	
1/24/2013	bmb	HS2	ML600-1	FN121510-01	0.3031	0.303

## 0.300 g/100mL Certified Reference Standard Control Data

1/28/2013	CRF	HS1	ML600-1	FN121510-01	0.2997	
1/28/2013	CRF	HS1	ML600-1	FN121510-01	0.3016	0.300
1/28/2013	CRF	HS1	ML600-1	FN121510-01	0.3043	
1/28/2013	CRF	HS1	ML600-1	FN121510-01	0.3046	0.304
2/6/2013	COB	HS1	ML600-1	FN121510-01	0.3024	
2/6/2013	COB	HS1	ML600-1	FN121510-01	0.3016	0.302
2/6/2013	COB	HS1	ML600-1	FN121510-01	0.3055	
2/6/2013	COB	HS1	ML600-1	FN121510-01	0.3047	0.305
2/12/2013	COB	HS2	ML600-1	FN121510-01	0.3004	
2/12/2013	COB	HS2	ML600-1	FN121510-01	0.3020	0.301
2/12/2013	COB	HS2	ML600-1	FN121510-01	0.3038	
2/12/2013	COB	HS2	ML600-1	FN121510-01	0.3052	0.304
2/25/2013	bmb	HS2	ML600-1	FN121510-01	0.3029	
2/25/2013	bmb	HS2	ML600-1	FN121510-01	0.3028	0.302
2/25/2013	bmb	HS2	ML600-1	FN121510-01	0.3093	
2/25/2013	bmb	HS2	ML600-1	FN121510-01	0.3085	0.308
3/7/2013	CRF	HS1	ML600-1	FN121510-01	0.3018	
3/7/2013	CRF	HS1	ML600-1	FN121510-01	0.3013	0.301
3/7/2013	CRF	HS1	ML600-1	FN121510-01	0.3040	
3/7/2013	CRF	HS1	ML600-1	FN121510-01	0.3047	0.304
3/12/2013	COB	HS2	ML600-1	FN121510-01	0.3038	
3/12/2013	COB	HS2	ML600-1	FN121510-01	0.3016	0.302
3/12/2013	COB	HS2	ML600-1	FN121510-01	0.3054	
3/12/2013	COB	HS2	ML600-1	FN121510-01	0.3045	0.304
3/26/2013	CRF	HS1	ML600-1	FN121510-01	0.3015	
3/26/2013	CRF	HS1	ML600-1	FN121510-01	0.3016	0.301
3/26/2013	CRF	HS1	ML600-1	FN121510-01	0.3014	
3/26/2013	CRF	HS1	ML600-1	FN121510-01	0.3014	0.301
4/2/2013	bmb	HS2	Wilma	FN121510-01	0.3038	
4/2/2013	bmb	HS2	Wilma	FN121510-01	0.3037	0.303
4/2/2013	bmb	HS2	Wilma	FN121510-01	0.3067	
4/2/2013	bmb	HS2	Wilma	FN121510-01	0.3062	0.306
4/15/2013	CRF	HS2	Wilma	FN121510-01	0.3022	
4/15/2013	CRF	HS2	Wilma	FN121510-01	0.3045	0.303
4/15/2013	CRF	HS2	Wilma	FN121510-01	0.3058	
4/15/2013	CRF	HS2	Wilma	FN121510-01	0.3086	0.307
4/25/2013	COB	HS1	Wilma	FN121510-01	0.3026	
4/25/2013	COB	HS1	Wilma	FN121510-01	0.3039	0.303
4/25/2013	COB	HS1	Wilma	FN121510-01	0.3105	
4/25/2013	COB	HS1	Wilma	FN121510-01	0.3068	0.308
4/30/2013	bmb	HS2	Wilma	FN121510-01	0.3038	
4/30/2013	bmb	HS2	Wilma	FN121510-01	0.3039	0.303
4/30/2013	bmb	HS2	Wilma	FN121510-01	0.3075	
4/30/2013	bmb	HS2	Wilma	FN121510-01	0.3066	0.307
5/7/2013	COB	HS1	Wilma	FN121510-01	0.3019	
5/7/2013	COB	HS1	Wilma	FN121510-01	0.3026	0.302
5/7/2013	COB	HS1	Wilma	FN121510-01	0.3017	
5/7/2013	COB	HS1	Wilma	FN121510-01	0.3024	0.302
5/14/2013	CRF	HS2	Wilma	FN121510-01	0.3011	
5/14/2013	CRF	HS2	Wilma	FN121510-01	0.3021	0.301
5/14/2013	CRF	HS2	Wilma	FN121510-01	0.3063	
5/14/2013	CRF	HS2	Wilma	FN121510-01	0.3053	0.305
5/31/2013	bmb	HS2	Wilma	FN121510-01	0.3035	
5/31/2013	bmb	HS2	Wilma	FN121510-01	0.3035	0.303
5/31/2013	bmb	HS2	Wilma	FN121510-01	0.3068	
5/31/2013	bmb	HS2	Wilma	FN121510-01	0.3059	0.306
6/7/2013	CRF	HS1	Wilma	FN121510-01	0.3035	
6/7/2013	CRF	HS1	Wilma	FN121510-01	0.3048	0.304
6/7/2013	CRF	HS1	Wilma	FN121510-01	0.3076	
6/7/2013	CRF	HS1	Wilma	FN121510-01	0.3086	0.308
6/19/2013	bmb	HS2	Wilma	FN121510-01	0.2993	
6/19/2013	bmb	HS2	Wilma	FN121510-01	0.2988	0.299
6/19/2013	bmb	HS2	Wilma	FN121510-01	0.3018	
6/19/2013	bmb	HS2	Wilma	FN121510-01	0.3036	0.302
6/27/2013	CRF	HS1	Wilma	FN121510-01	0.3039	
6/27/2013	CRF	HS1	Wilma	FN121510-01	0.3040	0.303
6/27/2013	CRF	HS1	Wilma	FN121510-01	0.3076	
6/27/2013	CRF	HS1	Wilma	FN121510-01	0.3075	0.307
6/29/2013	bmb	HS2	Wilma	FN121510-01	0.2995	
6/29/2013	bmb	HS2	Wilma	FN121510-01	0.3005	0.300
6/29/2013	bmb	HS2	Wilma	FN121510-01	0.3020	

6/29/2013	bmb	HS2	Wilma	FN121510-01	0.2997	0.300
7/3/2013	bmb	HS1	Wilma	FN121510-01	0.3058	
7/3/2013	bmb	HS1	Wilma	FN121510-01	0.3055	0.305
7/3/2013	bmb	HS1	Wilma	FN121510-01	0.3114	
7/3/2013	bmb	HS1	Wilma	FN121510-01	0.3097	0.310
7/12/2013	CRF	HS2	Wilma	FN121510-01	0.2998	
7/12/2013	CRF	HS2	Wilma	FN121510-01	0.3012	0.300
7/12/2013	CRF	HS2	Wilma	FN121510-01	0.3050	
7/12/2013	CRF	HS2	Wilma	FN121510-01	0.3054	0.305
7/12/2013	bmb	HS1	Wilma	FN121510-01	0.3044	
7/12/2013	bmb	HS1	Wilma	FN121510-01	0.3065	0.305
7/12/2013	bmb	HS1	Wilma	FN121510-01	0.3069	
7/12/2013	bmb	HS1	Wilma	FN121510-01	0.3103	0.308
7/25/2013	COB	HS2	Wilma	FN121510-01	0.3049	
7/25/2013	COB	HS2	Wilma	FN121510-01	0.3075	0.306
7/25/2013	COB	HS2	Wilma	FN121510-01	0.3087	
7/25/2013	COB	HS2	Wilma	FN121510-01	0.3091	0.308
8/14/2013	CRF	HS1	Wilma	FN121510-01	0.3019	
8/14/2013	CRF	HS1	Wilma	FN121510-01	0.3020	0.301
8/14/2013	CRF	HS1	Wilma	FN121510-01	0.3058	
8/14/2013	CRF	HS1	Wilma	FN121510-01	0.3057	0.305
8/19/2013	bmb	HS1	Wilma	FN121510-01	0.3021	
8/19/2013	bmb	HS1	Wilma	FN121510-01	0.3040	0.303
8/19/2013	bmb	HS1	Wilma	FN121510-01	0.3058	
8/19/2013	bmb	HS1	Wilma	FN121510-01	0.3061	0.305
8/20/2013	COB	HS2	Wilma	FN121510-01	0.3025	
8/20/2013	COB	HS2	Wilma	FN121510-01	0.3055	0.304
8/20/2013	COB	HS2	Wilma	FN121510-01	0.3112	
8/20/2013	COB	HS2	Wilma	FN121510-01	0.3103	0.310
8/30/2013	COB	HS2	Wilma	FN121510-01	0.3025	
8/30/2013	COB	HS2	Wilma	FN121510-01	0.3045	0.303
8/30/2013	COB	HS2	Wilma	FN121510-01	0.3110	
8/30/2013	COB	HS2	Wilma	FN121510-01	0.3112	0.311
9/20/2013	bmb	HS2	Wilma	FN121510-01	0.3025	
9/20/2013	bmb	HS2	Wilma	FN121510-01	0.3022	0.302
9/20/2013	bmb	HS2	Wilma	FN121510-01	0.3075	
9/20/2013	bmb	HS2	Wilma	FN121510-01	0.3080	0.307
9/23/2013	CRF	HS1	Wilma	FN121510-01	0.3027	
9/23/2013	CRF	HS1	Wilma	FN121510-01	0.3023	0.302
9/23/2013	CRF	HS1	Wilma	FN121510-01	0.3044	
9/23/2013	CRF	HS1	Wilma	FN121510-01	0.3048	0.304
9/26/2013	COB	HS1	Wilma	FN121510-01	0.3021	
9/26/2013	COB	HS1	Wilma	FN121510-01	0.3042	0.303
9/26/2013	COB	HS1	Wilma	FN121510-01	0.3081	
9/26/2013	COB	HS1	Wilma	FN121510-01	0.3055	0.306
10/11/2013	CRF	HS2	Wilma	FN121510-01	0.3006	
10/11/2013	CRF	HS2	Wilma	FN121510-01	0.3035	0.302
10/11/2013	CRF	HS2	Wilma	FN121510-01	0.3050	
10/11/2013	CRF	HS2	Wilma	FN121510-01	0.3056	0.305

## Blood Matrix QC Reproducibility Data (Lot 8897)

N=	32	Mean=	0.0831	SD=	0.0009	SD*2=	0.0019	%RSD=	1.1	%RSD*2	2.3	%Bias	-3.4
Date	Anaylst	Instrument	Pipettor	Lot	Value (.086)								
6/28/2012	CRF	HS2	Wilma	8897	0.0838								
6/28/2012	CRF	HS2	Wilma	8897	0.0835	0.083							
6/28/2012	CRF	HS2	Wilma	8897	0.0848								
6/28/2012	CRF	HS2	Wilma	8897	0.0849	0.084							
6/29/2012	bmb	HS2	Wilma	8897	0.0835								
6/29/2012	bmb	HS2	Wilma	8897	0.0827	0.083							
6/29/2012	bmb	HS2	Wilma	8897	0.0852								
6/29/2012	bmb	HS2	Wilma	8897	0.0833	0.084							
7/3/2012	CRF	HS2	Wilma	8897	0.0840								
7/3/2012	CRF	HS2	Wilma	8897	0.0837	0.083							
7/3/2012	CRF	HS2	Wilma	8897	0.0849								
7/3/2012	CRF	HS2	Wilma	8897	0.0845	0.084							
7/9/2012	bmb	HS2	Wilma	8897	0.0837								
7/9/2012	bmb	HS2	Wilma	8897	0.0820	0.082							
7/9/2012	bmb	HS2	Wilma	8897	0.0833								
7/9/2012	bmb	HS2	Wilma	8897	0.0839	0.083							
7/10/2012	COB	HS2	Wilma	8897	0.0843								
7/10/2012	COB	HS2	Wilma	8897	0.0841	0.084							
7/10/2012	COB	HS2	Wilma	8897	0.0845								
7/10/2012	COB	HS2	Wilma	8897	0.0834	0.083							
7/11/2012	CRF	HS2	Wilma	8897	0.0830								
7/11/2012	CRF	HS2	Wilma	8897	0.0829	0.082							
7/11/2012	CRF	HS2	Wilma	8897	0.0831								
7/11/2012	CRF	HS2	Wilma	8897	0.0840	0.083							
7/16/2012	bmb	HS2	Wilma	8897	0.0837								
7/16/2012	bmb	HS2	Wilma	8897	0.0829	0.083							
7/16/2012	bmb	HS2	Wilma	8897	0.0839								
7/16/2012	bmb	HS2	Wilma	8897	0.0843	0.084							
7/18/2012	COB	HS2	Wilma	8897	0.0856								
7/18/2012	COB	HS2	Wilma	8897	0.0844	0.085							
7/18/2012	COB	HS2	Wilma	8897	0.0860								
7/18/2012	COB	HS2	Wilma	8897	0.0848	0.085							
7/26/2012	CRF	HS2	Wilma	8897	0.0842								
7/26/2012	CRF	HS2	Wilma	8897	0.0835	0.083							
7/26/2012	CRF	HS2	Wilma	8897	0.0842								
7/26/2012	CRF	HS2	Wilma	8897	0.0844	0.084							
7/30/2012	COB	HS2	Wilma	8897	0.0825								
7/30/2012	COB	HS2	Wilma	8897	0.0821	0.082							
7/30/2012	COB	HS2	Wilma	8897	0.0831								
7/30/2012	COB	HS2	Wilma	8897	0.0829	0.083							
8/2/2012	COB	HS2	Wilma	8897	0.0838								
8/2/2012	COB	HS2	Wilma	8897	0.0832	0.083							
8/2/2012	COB	HS2	Wilma	8897	0.0843								
8/2/2012	COB	HS2	Wilma	8897	0.0842	0.084							
8/9/2012	bmb	HS2	Wilma	8897	0.0815								
8/9/2012	bmb	HS2	Wilma	8897	0.0817	0.081							
8/9/2012	bmb	HS2	Wilma	8897	0.0819								
8/9/2012	bmb	HS2	Wilma	8897	0.0813	0.081							
8/13/2012	CRF	HS2	Wilma	8897	0.0827								
8/13/2012	CRF	HS2	Wilma	8897	0.0824	0.082							
8/13/2012	CRF	HS2	Wilma	8897	0.0834								
8/13/2012	CRF	HS2	Wilma	8897	0.0833	0.083							
8/16/2012	CRF	HS2	Wilma	8897	0.0834								
8/16/2012	CRF	HS2	Wilma	8897	0.0828	0.083							
8/16/2012	CRF	HS2	Wilma	8897	0.0830								
8/16/2012	CRF	HS2	Wilma	8897	0.0832	0.083							
8/22/2012	COB	HS2	Wilma	8897	0.0833								
8/22/2012	COB	HS2	Wilma	8897	0.0826	0.082							
8/22/2012	COB	HS2	Wilma	8897	0.0835								
8/22/2012	COB	HS2	Wilma	8897	0.0826	0.083							
9/7/2012	COB	HS2	Wilma	8897	0.0833								
9/7/2012	COB	HS2	Wilma	8897	0.0828	0.083							
9/7/2012	COB	HS2	Wilma	8897	0.0838								
9/7/2012	COB	HS2	Wilma	8897	0.0841	0.083							

## Blood Matrix QC Reproducibility Data (Lot 9144)

N=	26	Mean=	0.0799	SD=	0.0010	SD*2=	0.0019	%RSD=	1.2	%RSD*2	2.4	%Bias	-2.6
Date	Anaylst	Instrument	Pipetter	Lot	Value (.082)		Reported						
9/12/2012	bmb	HS2	Wilma	9144	0.0795								
9/12/2012	bmb	HS2	Wilma	9144	0.0792	0.079							
9/12/2012	bmb	HS2	Wilma	9144	0.0806								
9/12/2012	bmb	HS2	Wilma	9144	0.0799	0.080							
9/17/2012	CRF	HS2	Wilma	9144	0.0803								
9/17/2012	CRF	HS2	Wilma	9144	0.0803	0.080							
9/17/2012	CRF	HS2	Wilma	9144	0.0806								
9/17/2012	CRF	HS2	Wilma	9144	0.0811	0.080							
9/25/2012	COB	HS2	Wilma	9144	0.0790								
9/25/2012	COB	HS2	Wilma	9144	0.0786	0.078							
9/25/2012	COB	HS2	Wilma	9144	0.0800								
9/25/2012	COB	HS2	Wilma	9144	0.0797	0.079							
10/5/2012	COB	HS2	Wilma	9144	0.0841								
10/5/2012	COB	HS2	Wilma	9144	0.0809	0.082							
10/5/2012	COB	HS2	Wilma	9144	0.0832								
10/5/2012	COB	HS2	Wilma	9144	0.0810	0.082							
10/15/2012	CRF	HS2	Wilma	9144	0.0796								
10/15/2012	CRF	HS2	Wilma	9144	0.0802	0.079							
10/15/2012	CRF	HS2	Wilma	9144	0.0807								
10/15/2012	CRF	HS2	Wilma	9144	0.0803	0.080							
10/17/2012	bmb	HS2	Wilma	9144	0.0806								
10/17/2012	bmb	HS2	Wilma	9144	0.0792	0.079							
10/17/2012	bmb	HS2	Wilma	9144	0.0808								
10/17/2012	bmb	HS2	Wilma	9144	0.0810	0.080							
10/19/2012	CRF	HS2	Wilma	9144	0.0805								
10/19/2012	CRF	HS2	Wilma	9144	0.0798	0.080							
10/19/2012	CRF	HS2	Wilma	9144	0.0812								
10/19/2012	CRF	HS2	Wilma	9144	0.0807	0.080							
10/23/2012	COB	HS2	Wilma	9144	0.0827								
10/23/2012	COB	HS2	Wilma	9144	0.0802	0.081							
10/23/2012	COB	HS2	Wilma	9144	0.0819								
10/23/2012	COB	HS2	Wilma	9144	0.0812	0.081							
11/2/2012	bmb	HS2	ML600-1	9144	0.0800								
11/2/2012	bmb	HS2	ML600-1	9144	0.0797	0.079							
11/2/2012	bmb	HS2	ML600-1	9144	0.0805								
11/2/2012	bmb	HS2	ML600-1	9144	0.0808	0.080							
11/6/2012	CRF	HS2	ML600-1	9144	0.0798								
11/6/2012	CRF	HS2	ML600-1	9144	0.0789	0.079							
11/6/2012	CRF	HS2	ML600-1	9144	0.0798								
11/6/2012	CRF	HS2	ML600-1	9144	0.0805	0.080							
11/16/2012	COB	HS2	ML600-1	9144	0.0801								
11/16/2012	COB	HS2	ML600-1	9144	0.0793	0.079							
11/16/2012	COB	HS2	ML600-1	9144	0.0801								
11/16/2012	COB	HS2	ML600-1	9144	0.0806	0.080							
11/16/2012	bmb	HS2	ML600-1	9144	0.0800								
11/16/2012	bmb	HS2	ML600-1	9144	0.0805	0.080							
11/16/2012	bmb	HS2	ML600-1	9144	0.0803								
11/16/2012	bmb	HS2	ML600-1	9144	0.0809	0.080							
11/20/2012	CRF	HS2	ML600-1	9144	0.0801								
11/20/2012	CRF	HS2	ML600-1	9144	0.0794	0.079							
11/20/2012	CRF	HS2	ML600-1	9144	0.0810								
11/20/2012	CRF	HS2	ML600-1	9144	0.0811	0.081							

## Blood Matrix QC Reproducibility Data (Lot 9736)

N=	32	Mean=	0.0822	SD=	0.0008	SD*2=	0.0017	%RSD=	1.0	%RSD*2	2.0	%Bias	-2.1
Date	Anaylist	Instrument	Pipettor	Lot	Value (.084)		Reported						
11/28/2012	COB	HS2	ML600-1	9736	0.0827								
11/28/2012	COB	HS2	ML600-1	9736	0.0809	0.081							
11/28/2012	COB	HS2	ML600-1	9736	0.0844								
11/28/2012	COB	HS2	ML600-1	9736	0.0823	0.083							
12/3/2012	CRF	HS1	ML600-1	9736	0.0829								
12/3/2012	CRF	HS1	ML600-1	9736	0.0817	0.082							
12/3/2012	CRF	HS1	ML600-1	9736	0.0831								
12/3/2012	CRF	HS1	ML600-1	9736	0.0833	0.083							
12/13/2012	bmb	HS2	ML600-1	9736	0.0824								
12/13/2012	bmb	HS2	ML600-1	9736	0.0821	0.082							
12/13/2012	bmb	HS2	ML600-1	9736	0.0837								
12/13/2012	bmb	HS2	ML600-1	9736	0.0832	0.083							
12/21/2012	COB	HS2	ML600-1	9736	0.0850								
12/21/2012	COB	HS2	ML600-1	9736	0.0831	0.084							
12/21/2012	COB	HS2	ML600-1	9736	0.0830								
12/21/2012	COB	HS2	ML600-1	9736	0.0831	0.083							
12/26/2012	CRF	HS1	ML600-1	9736	0.0814								
12/26/2012	CRF	HS1	ML600-1	9736	0.0819	0.081							
12/26/2012	CRF	HS1	ML600-1	9736	0.0827								
12/26/2012	CRF	HS1	ML600-1	9736	0.0827	0.082							
1/14/2013	COB	HS2	ML600-1	9736	0.0834								
1/14/2013	COB	HS2	ML600-1	9736	0.0841	0.083							
1/14/2013	COB	HS2	ML600-1	9736	0.0831								
1/14/2013	COB	HS2	ML600-1	9736	0.0828	0.082							
1/24/2013	bmb	HS2	ML600-1	9736	0.0814								
1/24/2013	bmb	HS2	ML600-1	9736	0.0812	0.081							
1/24/2013	bmb	HS2	ML600-1	9736	0.0831								
1/24/2013	bmb	HS2	ML600-1	9736	0.0824	0.082							
1/28/2013	CRF	HS1	ML600-1	9736	0.0829								
1/28/2013	CRF	HS1	ML600-1	9736	0.0823	0.082							
1/28/2013	CRF	HS1	ML600-1	9736	0.0833								
1/28/2013	CRF	HS1	ML600-1	9736	0.0833	0.083							
2/6/2013	COB	HS1	ML600-1	9736	0.0831								
2/6/2013	COB	HS1	ML600-1	9736	0.0821	0.082							
2/6/2013	COB	HS1	ML600-1	9736	0.0838								
2/6/2013	COB	HS1	ML600-1	9736	0.0830	0.083							
2/12/2013	COB	HS2	ML600-1	9736	0.0828								
2/12/2013	COB	HS2	ML600-1	9736	0.0832	0.083							
2/12/2013	COB	HS2	ML600-1	9736	0.0834								
2/12/2013	COB	HS2	ML600-1	9736	0.0834	0.083							
2/25/2013	bmb	HS2	ML600-1	9736	0.0826								
2/25/2013	bmb	HS2	ML600-1	9736	0.0825	0.082							
2/25/2013	bmb	HS2	ML600-1	9736	0.0834								
2/25/2013	bmb	HS2	ML600-1	9736	0.0829	0.083							
3/7/2013	CRF	HS1	ML600-1	9736	0.0816								
3/7/2013	CRF	HS1	ML600-1	9736	0.0821	0.081							
3/7/2013	CRF	HS1	ML600-1	9736	0.0829								
3/7/2013	CRF	HS1	ML600-1	9736	0.0828	0.082							
3/12/2013	COB	HS2	ML600-1	9736	0.0838								
3/12/2013	COB	HS2	ML600-1	9736	0.0835	0.083							
3/12/2013	COB	HS2	ML600-1	9736	0.0830								
3/12/2013	COB	HS2	ML600-1	9736	0.0837	0.083							
3/26/2013	CRF	HS1	ML600-1	9736	0.0817								
3/26/2013	CRF	HS1	ML600-1	9736	0.0813	0.081							
3/26/2013	CRF	HS1	ML600-1	9736	0.0821								
3/26/2013	CRF	HS1	ML600-1	9736	0.0821	0.082							
4/2/2013	bmb	HS2	Wilma	9736	0.0819								
4/2/2013	bmb	HS2	Wilma	9736	0.0816	0.081							
4/2/2013	bmb	HS2	Wilma	9736	0.0828								
4/2/2013	bmb	HS2	Wilma	9736	0.0822	0.082							
4/15/2013	CRF	HS2	Wilma	9736	0.0824								
4/15/2013	CRF	HS2	Wilma	9736	0.0812	0.081							
4/15/2013	CRF	HS2	Wilma	9736	0.0830								
4/15/2013	CRF	HS2	Wilma	9736	0.0826	0.082							

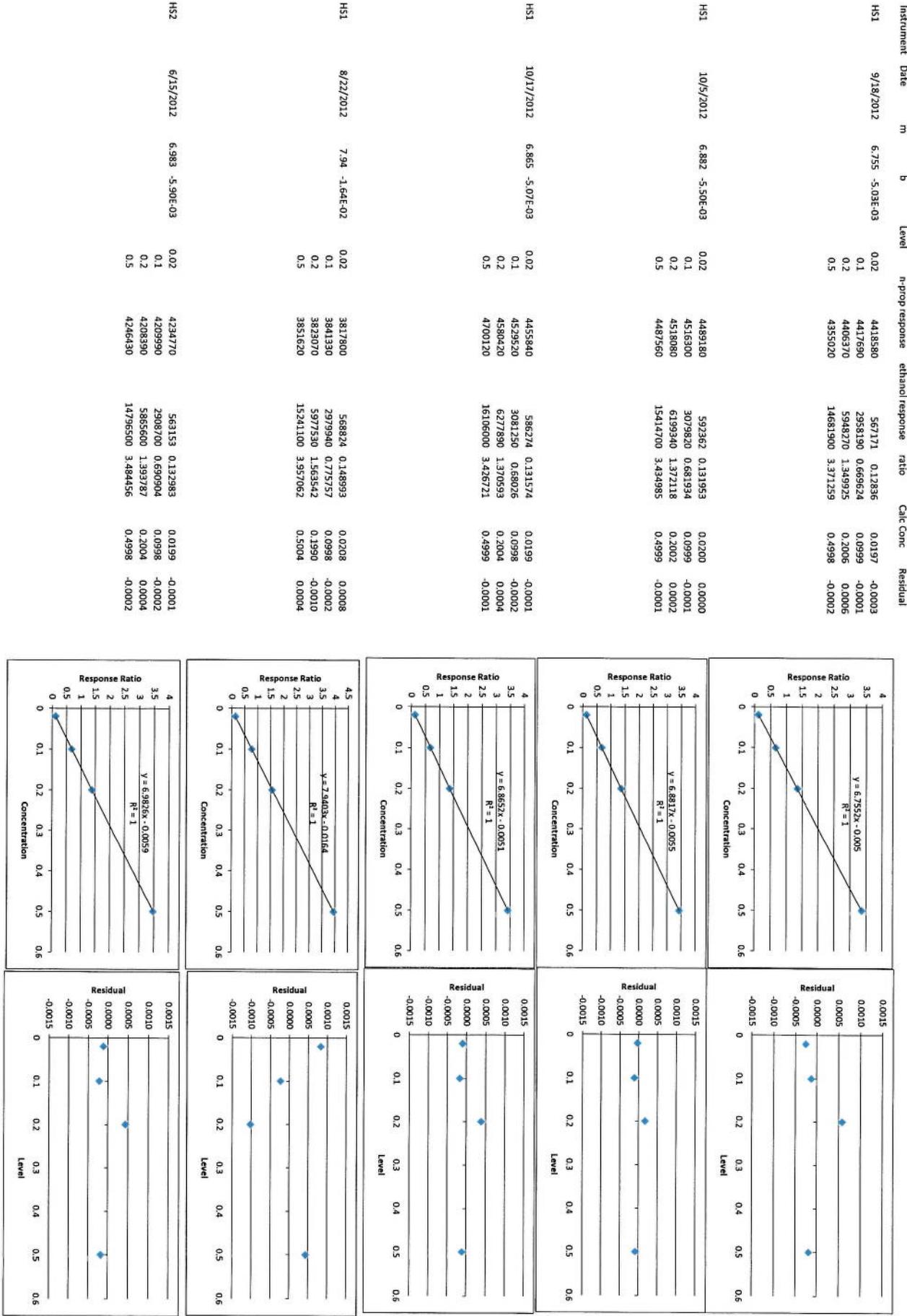
## Blood Matrix QC Reproducibility Data (Lot A0577)

N=	32	Mean=	0.0837	SD=	0.0010	SD*2=	0.0020	%RSD=	1.2	%RSD*2	2.4	%Bias	-2.7
Date	Anaylst	Instrument	Pipetter	Lot	Value (.086)	Reported							
4/25/2013	COB	HS1	Wilma	A0577	0.0858								
4/25/2013	COB	HS1	Wilma	A0577	0.0857	0.085							
4/25/2013	COB	HS1	Wilma	A0577	0.0858								
4/25/2013	COB	HS1	Wilma	A0577	0.0855	0.085							
4/30/2013	bmb	HS2	Wilma	A0577	0.0843								
4/30/2013	bmb	HS2	Wilma	A0577	0.0836	0.083							
4/30/2013	bmb	HS2	Wilma	A0577	0.0854								
4/30/2013	bmb	HS2	Wilma	A0577	0.0846	0.085							
5/7/2013	COB	HS1	Wilma	A0577	0.0857								
5/7/2013	COB	HS1	Wilma	A0577	0.0860	0.085							
5/7/2013	COB	HS1	Wilma	A0577	0.0851								
5/7/2013	COB	HS1	Wilma	A0577	0.0856	0.085							
5/14/2013	CRF	HS2	Wilma	A0577	0.0846								
5/14/2013	CRF	HS2	Wilma	A0577	0.0840	0.084							
5/14/2013	CRF	HS2	Wilma	A0577	0.0849								
5/14/2013	CRF	HS2	Wilma	A0577	0.0851	0.085							
5/31/2013	bmb	HS2	Wilma	A0577	0.0847								
5/31/2013	bmb	HS2	Wilma	A0577	0.0837	0.084							
5/31/2013	bmb	HS2	Wilma	A0577	0.0851								
5/31/2013	bmb	HS2	Wilma	A0577	0.0857	0.085							
6/7/2013	CRF	HS1	Wilma	A0577	0.0846								
6/7/2013	CRF	HS1	Wilma	A0577	0.0852	0.084							
6/7/2013	CRF	HS1	Wilma	A0577	0.0849								
6/7/2013	CRF	HS1	Wilma	A0577	0.0852	0.085							
6/19/2013	bmb	HS2	Wilma	A0577	0.0834								
6/19/2013	bmb	HS2	Wilma	A0577	0.0829	0.083							
6/19/2013	bmb	HS2	Wilma	A0577	0.0840								
6/19/2013	bmb	HS2	Wilma	A0577	0.0835	0.083							
6/27/2013	CRF	HS1	Wilma	A0577	0.0829								
6/27/2013	CRF	HS1	Wilma	A0577	0.0828	0.082							
6/27/2013	CRF	HS1	Wilma	A0577	0.0835								
6/27/2013	CRF	HS1	Wilma	A0577	0.0843	0.083							
7/3/2013	bmb	HS1	Wilma	A0577	0.0847								
7/3/2013	bmb	HS1	Wilma	A0577	0.0840	0.084							
7/3/2013	bmb	HS1	Wilma	A0577	0.0841								
7/3/2013	bmb	HS1	Wilma	A0577	0.0841	0.084							
7/12/2013	CRF	HS2	Wilma	A0577	0.0831								
7/12/2013	CRF	HS2	Wilma	A0577	0.0829	0.083							
7/12/2013	CRF	HS2	Wilma	A0577	0.0825								
7/12/2013	CRF	HS2	Wilma	A0577	0.0838	0.083							
7/12/2013	bmb	HS1	Wilma	A0577	0.0835								
7/12/2013	bmb	HS1	Wilma	A0577	0.0833	0.083							
7/12/2013	bmb	HS1	Wilma	A0577	0.0842								
7/12/2013	bmb	HS1	Wilma	A0577	0.0846	0.084							
7/25/2013	COB	HS2	Wilma	A0577	0.0843								
7/25/2013	COB	HS2	Wilma	A0577	0.0834	0.083							
7/25/2013	COB	HS2	Wilma	A0577	0.0857								
7/25/2013	COB	HS2	Wilma	A0577	0.0846	0.085							
8/14/2013	CRF	HS1	Wilma	A0577	0.0824								
8/14/2013	CRF	HS1	Wilma	A0577	0.0824	0.082							
8/14/2013	CRF	HS1	Wilma	A0577	0.0833								
8/14/2013	CRF	HS1	Wilma	A0577	0.0829	0.083							
8/19/2013	bmb	HS1	Wilma	A0577	0.0823								
8/19/2013	bmb	HS1	Wilma	A0577	0.0832	0.082							
8/19/2013	bmb	HS1	Wilma	A0577	0.0832								
8/19/2013	bmb	HS1	Wilma	A0577	0.0831	0.083							
8/20/2013	COB	HS2	Wilma	A0577	0.0831								
8/20/2013	COB	HS2	Wilma	A0577	0.0838	0.083							
8/20/2013	COB	HS2	Wilma	A0577	0.0846								
8/20/2013	COB	HS2	Wilma	A0577	0.0845	0.084							
8/30/2013	COB	HS2	Wilma	A0577	0.0836								
8/30/2013	COB	HS2	Wilma	A0577	0.0835	0.083							
8/30/2013	COB	HS2	Wilma	A0577	0.0852								
8/30/2013	COB	HS2	Wilma	A0577	0.0839	0.084							

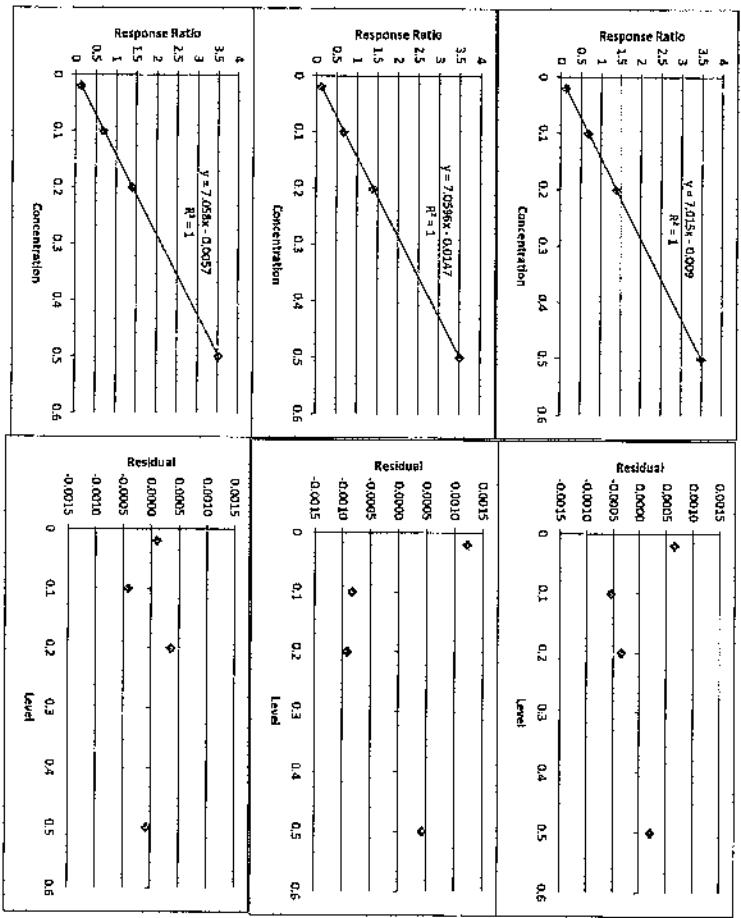
## Blood Matrix QC Reproducibility Data (Lot A1442)

N=	8	Mean=	0.0795	SD=	0.0008	SD*2=	0.0015	%RSD=	1.0	%RSD*2	1.9	%Bias	-1.9
Date	Anaylst	Instrument	Pipetter	Lot	Value (.081)		Reported						
9/20/2013	bmb	HS2	Wilma	A1442		0.0792							
9/20/2013	bmb	HS2	Wilma	A1442		0.0796	0.079						
9/20/2013	bmb	HS2	Wilma	A1442		0.0798							
9/20/2013	bmb	HS2	Wilma	A1442		0.08	0.079						
9/23/2013	CRF	HS1	Wilma	A1442		0.0794							
9/23/2013	CRF	HS1	Wilma	A1442		0.0791	0.079						
9/23/2013	CRF	HS1	Wilma	A1442		0.0802							
9/23/2013	CRF	HS1	Wilma	A1442		0.0803	0.080						
9/26/2013	COB	HS1	Wilma	A1442		0.0808							
9/26/2013	COB	HS1	Wilma	A1442		0.0800	0.080						
9/26/2013	COB	HS1	Wilma	A1442		0.0816							
9/26/2013	COB	HS1	Wilma	A1442		0.0806	0.081						
10/11/2013	CRF	HS2	Wilma	A1442		0.0792							
10/11/2013	CRF	HS2	Wilma	A1442		0.0792	0.079						
10/11/2013	CRF	HS2	Wilma	A1442		0.0791							
10/11/2013	CRF	HS2	Wilma	A1442		0.0789	0.079						

Method Validation-Residual Plots



Method Validation Residual Plots

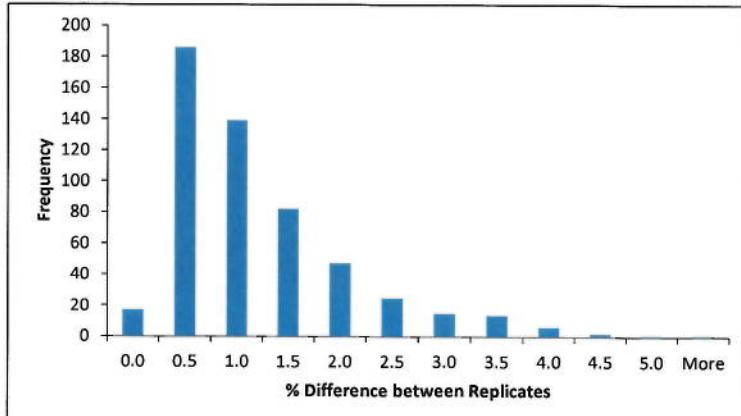


Replicate Agreement Data from Case Samples

result1	result2	case_id	Mean	Difference	%Diff
0.0973	0.0973	12-03266	0.0973	0.0000	0.0
0.1467	0.1467	12-04059	0.1467	0.0000	0.0
0.0644	0.0644	12-04280	0.0644	0.0000	0.0
0.0254	0.0254	12-04349	0.0254	0.0000	0.0
0.0281	0.0281	12-04611	0.0281	0.0000	0.0
0.0292	0.0292	12-05087	0.0292	0.0000	0.0
0.1219	0.1219	12-05397	0.1219	0.0000	0.0
0.0761	0.0761	12-05535	0.0761	0.0000	0.0
0.0263	0.0263	13-00359	0.0263	0.0000	0.0
0.1223	0.1223	13-00528	0.1223	0.0000	0.0
0.1267	0.1267	13-00532	0.1267	0.0000	0.0
0.0392	0.0392	13-00576	0.0392	0.0000	0.0
0.1000	0.1000	13-02455	0.1000	0.0000	0.0
0.0647	0.0647	13-02517	0.0647	0.0000	0.0
0.1964	0.1964	13-02988	0.1964	0.0000	0.0
0.0368	0.0368	13-04243	0.0368	0.0000	0.0
0.0356	0.0356	13-05178	0.0356	0.0000	0.0
0.2817	0.2816	13-01108	0.2817	0.0001	0.0
0.2734	0.2733	13-01433	0.2734	0.0001	0.0
0.2526	0.2527	13-01131	0.2527	0.0001	0.0
0.2446	0.2445	13-01628	0.2446	0.0001	0.0
0.2333	0.2334	12-06396	0.2334	0.0001	0.0
0.2314	0.2313	13-00986	0.2314	0.0001	0.0
0.2032	0.2031	13-04782	0.2032	0.0001	0.0
0.1951	0.1952	13-02454	0.1952	0.0001	0.1
0.1867	0.1868	13-02826	0.1868	0.0001	0.1
0.1769	0.1770	13-01134	0.1770	0.0001	0.1
0.1724	0.1725	12-04117	0.1725	0.0001	0.1
0.1723	0.1724	13-00991	0.1724	0.0001	0.1
0.1659	0.1660	13-01774	0.1660	0.0001	0.1
0.1649	0.1648	13-03176	0.1649	0.0001	0.1
0.3269	0.3271	13-02287	0.3270	0.0002	0.1
0.1557	0.1556	12-06469	0.1557	0.0001	0.1
0.3109	0.3107	13-04013	0.3108	0.0002	0.1
0.1377	0.1376	12-04290	0.1377	0.0001	0.1
0.1295	0.1294	12-07243	0.1295	0.0001	0.1
0.1295	0.1294	12-07243	0.1295	0.0001	0.1
0.1278	0.1277	13-01594	0.1278	0.0001	0.1
0.2513	0.2511	13-00521	0.2512	0.0002	0.1
0.2501	0.2503	13-00975	0.2502	0.0002	0.1
0.1182	0.1183	13-03077	0.1183	0.0001	0.1
0.1135	0.1136	12-03315	0.1136	0.0001	0.1
0.2211	0.2209	12-03113	0.2210	0.0002	0.1
0.3252	0.3255	12-04833	0.3254	0.0003	0.1
0.3252	0.3255	12-04833	0.3254	0.0003	0.1
0.1074	0.1073	13-02263	0.1074	0.0001	0.1
0.1058	0.1059	13-04015	0.1059	0.0001	0.1
0.0989	0.0990	12-03733	0.0990	0.0001	0.1
0.0949	0.0950	13-05254	0.0950	0.0001	0.1
0.0929	0.0930	12-03284	0.0930	0.0001	0.1
0.1851	0.1849	13-04313	0.1850	0.0002	0.1
0.0909	0.0910	12-05658	0.0910	0.0001	0.1
0.0833	0.0832	13-03277	0.0833	0.0001	0.1
0.2441	0.2438	13-01093	0.2440	0.0003	0.1
0.0791	0.0792	12-04402	0.0792	0.0001	0.1
0.1558	0.1560	12-05289	0.1559	0.0002	0.1
0.0776	0.0777	13-02429	0.0777	0.0001	0.1
0.1468	0.1470	12-05956	0.1469	0.0002	0.1
0.2192	0.2189	12-06879	0.2191	0.0003	0.1
0.1426	0.1428	13-02460	0.1427	0.0002	0.1
0.2773	0.2777	13-05395	0.2775	0.0004	0.1
0.2070	0.2067	12-04287	0.2069	0.0003	0.1
0.0662	0.0663	12-07271	0.0663	0.0001	0.2
0.1306	0.1308	13-02612	0.1307	0.0002	0.2
0.1254	0.1252	12-03781	0.1253	0.0002	0.2
0.1237	0.1235	13-04781	0.1236	0.0002	0.2
0.0591	0.0590	12-06997	0.0591	0.0001	0.2
0.1170	0.1168	13-05397	0.1169	0.0002	0.2
0.2284	0.2280	13-03124	0.2282	0.0004	0.2
0.1693	0.1696	13-03074	0.1695	0.0003	0.2
0.1129	0.1127	13-05229	0.1128	0.0002	0.2
0.1125	0.1127	13-01423	0.1126	0.0002	0.2
0.2229	0.2225	13-01775	0.2227	0.0004	0.2
0.0546	0.0547	13-00582	0.0547	0.0001	0.2
0.2707	0.2712	13-02989	0.2710	0.0005	0.2

%Diff	Frequency	%	Cumul%
0.0	17	3.2	3.2
0.5	186	34.8	37.9
1.0	139	26.0	63.9
1.5	82	15.3	79.3
2.0	47	8.8	88.0
2.5	25	4.7	92.7
3.0	15	2.8	95.5
3.5	14	2.6	98.1
4.0	6	1.1	99.3
4.5	2	0.4	99.6
5.0	1	0.2	99.8
More	1	0.2	100.0

N	535
Mean	1.0



## Replicate Agreement Data from Case Samples

0.1622	0.1619	12-04112	0.1621	0.0003	0.2
0.1063	0.1061	13-01133	0.1062	0.0002	0.2
0.1047	0.1045	13-03522	0.1046	0.0002	0.2
0.1557	0.1560	13-02775	0.1569	0.0003	0.2
0.1546	0.1549	13-01165	0.1548	0.0003	0.2
0.1016	0.1018	13-03116	0.1017	0.0002	0.2
0.1004	0.1002	12-04018	0.1003	0.0002	0.2
0.1932	0.1928	13-00467	0.1930	0.0004	0.2
0.2387	0.2382	13-03245	0.2385	0.0005	0.2
0.0477	0.0476	13-02223	0.0477	0.0001	0.2
0.0951	0.0953	13-03128	0.0952	0.0002	0.2
0.0947	0.0949	12-05387	0.0948	0.0002	0.2
0.2828	0.2822	13-01340	0.2825	0.0006	0.2
0.2816	0.2810	13-02385	0.2813	0.0006	0.2
0.0934	0.0936	13-00652	0.0935	0.0002	0.2
0.2796	0.2802	12-04076	0.2799	0.0006	0.2
0.0925	0.0923	13-02401	0.0924	0.0002	0.2
0.1381	0.1384	12-06208	0.1383	0.0003	0.2
0.0452	0.0453	12-03999	0.0453	0.0001	0.2
0.0441	0.0442	13-04502	0.0442	0.0001	0.2
0.0433	0.0434	12-04073	0.0434	0.0001	0.2
0.1301	0.1298	13-01633	0.1300	0.0003	0.2
0.0850	0.0852	13-02502	0.0851	0.0002	0.2
0.0422	0.0421	13-04795	0.0422	0.0001	0.2
0.0420	0.0421	12-07008	0.0421	0.0001	0.2
0.0419	0.0418	13-00993	0.0419	0.0001	0.2
0.1200	0.1203	13-00685	0.1202	0.0003	0.2
0.1582	0.1578	13-04914	0.1580	0.0004	0.3
0.2362	0.2368	12-06889	0.2365	0.0006	0.3
0.0392	0.0393	13-00582	0.0393	0.0001	0.3
0.1556	0.1552	12-04483	0.1554	0.0004	0.3
0.0758	0.0756	12-03754	0.0757	0.0002	0.3
0.1497	0.1501	13-05045	0.1499	0.0004	0.3
0.2949	0.2957	13-00858	0.2953	0.0008	0.3
0.1831	0.1836	13-04968	0.1834	0.0005	0.3
0.0367	0.0366	13-00955	0.0367	0.0001	0.3
0.2554	0.2561	13-02658	0.2558	0.0007	0.3
0.0365	0.0364	12-03378	0.0365	0.0001	0.3
0.1086	0.1083	13-00815	0.1085	0.0003	0.3
0.3211	0.3220	13-02559	0.3216	0.0009	0.3
0.0355	0.0354	12-03206	0.0355	0.0001	0.3
0.1052	0.1055	13-02978	0.1054	0.0003	0.3
0.0690	0.0688	12-04930	0.0689	0.0002	0.3
0.1028	0.1031	13-02228	0.1030	0.0003	0.3
0.3071	0.3062	13-03284	0.3067	0.0009	0.3
0.1669	0.1674	12-04014	0.1672	0.0005	0.3
0.1000	0.0997	13-04199	0.0999	0.0003	0.3
0.2303	0.2296	12-03186	0.2300	0.0007	0.3
0.0328	0.0327	13-00659	0.0328	0.0001	0.3
0.2612	0.2620	13-01580	0.2616	0.0006	0.3
0.2932	0.2941	13-00858	0.2937	0.0009	0.3
0.3256	0.3266	13-02825	0.3261	0.0010	0.3
0.1295	0.1299	12-06724	0.1297	0.0004	0.3
0.1292	0.1288	13-02081	0.1290	0.0004	0.3
0.0319	0.0320	12-03233	0.0320	0.0001	0.3
0.3489	0.3500	13-02147	0.3495	0.0011	0.3
0.1240	0.1236	12-07009	0.1238	0.0004	0.3
0.2476	0.2468	13-05228	0.2472	0.0008	0.3
0.1828	0.1834	13-00714	0.1831	0.0006	0.3
0.1516	0.1511	12-05399	0.1514	0.0005	0.3
0.2999	0.3009	13-03468	0.3004	0.0010	0.3
0.1794	0.1800	12-04593	0.1797	0.0006	0.3
0.1793	0.1799	13-04030	0.1796	0.0006	0.3
0.1186	0.1190	13-04796	0.1188	0.0004	0.3
0.1783	0.1777	13-03154	0.1780	0.0006	0.3
0.1179	0.1183	13-02467	0.1181	0.0004	0.3
0.0293	0.0292	13-01162	0.0293	0.0001	0.3
0.2275	0.2283	12-04354	0.2279	0.0008	0.4
0.3361	0.3349	13-05319	0.3355	0.0012	0.4
0.1938	0.1931	13-02090	0.1935	0.0007	0.4
0.1104	0.1100	13-02992	0.1102	0.0004	0.4
0.0824	0.0821	12-05001	0.0823	0.0003	0.4
0.2184	0.2192	13-01596	0.2188	0.0008	0.4
0.2184	0.2192	13-01596	0.2188	0.0008	0.4
0.0814	0.0811	13-01632	0.0813	0.0003	0.4
0.1348	0.1353	13-02572	0.1351	0.0006	0.4

## Replicate Agreement Data from Case Samples

0.0538	0.0540	13-00808	0.0539	0.0002	0.4
0.0807	0.0804	13-02497	0.0806	0.0003	0.4
0.1338	0.1343	12-03233	0.1341	0.0005	0.4
0.0526	0.0528	12-04834	0.0527	0.0002	0.4
0.1548	0.1554	13-02593	0.1551	0.0008	0.4
0.2043	0.2051	12-03809	0.2047	0.0008	0.4
0.1534	0.1528	12-03303	0.1531	0.0006	0.4
0.1789	0.1782	13-00816	0.1786	0.0007	0.4
0.0255	0.0254	13-05310	0.0255	0.0001	0.4
0.0248	0.0249	12-03383	0.0249	0.0001	0.4
0.1735	0.1742	13-00608	0.1739	0.0007	0.4
0.2238	0.2229	13-04058	0.2234	0.0009	0.4
0.1242	0.1237	13-03604	0.1240	0.0005	0.4
0.1484	0.1490	12-04919	0.1487	0.0006	0.4
0.1965	0.1957	13-03081	0.1961	0.0008	0.4
0.1222	0.1217	13-05273	0.1220	0.0005	0.4
0.0484	0.0486	13-02951	0.0485	0.0002	0.4
0.0968	0.0964	12-04937	0.0966	0.0004	0.4
0.2411	0.2401	13-00105	0.2406	0.0010	0.4
0.1434	0.1428	12-04405	0.1431	0.0006	0.4
0.0695	0.0698	13-02422	0.0697	0.0003	0.4
0.0693	0.0696	13-03144	0.0685	0.0003	0.4
0.2309	0.2319	13-04589	0.2314	0.0010	0.4
0.2505	0.2516	13-00805	0.2511	0.0011	0.4
0.2023	0.2032	13-02807	0.2028	0.0009	0.4
0.0671	0.0674	12-04742	0.0673	0.0003	0.4
0.1554	0.1547	12-04321	0.1551	0.0007	0.5
0.0883	0.0887	13-03561	0.0885	0.0004	0.5
0.1981	0.1990	12-05391	0.1986	0.0009	0.5
0.0440	0.0442	12-07293	0.0441	0.0002	0.5
0.1102	0.1097	12-06575	0.1100	0.0005	0.5
0.0218	0.0219	12-03372	0.0219	0.0001	0.5
0.1314	0.1308	12-04960	0.1311	0.0006	0.5
0.1966	0.1957	12-05398	0.1962	0.0009	0.5
0.1516	0.1509	12-04752	0.1513	0.0007	0.5
0.0862	0.0866	12-04477	0.0864	0.0004	0.5
0.1288	0.1282	13-02396	0.1285	0.0006	0.5
0.0214	0.0213	13-01776	0.0214	0.0001	0.5
0.1685	0.1693	12-03731	0.1689	0.0008	0.5
0.1055	0.1050	13-01019	0.1053	0.0005	0.5
0.1256	0.1262	12-04861	0.1259	0.0006	0.5
0.0417	0.0415	13-00654	0.0416	0.0002	0.5
0.1459	0.1452	13-00466	0.1456	0.0007	0.5
0.1223	0.1229	13-02801	0.1226	0.0006	0.5
0.2043	0.2033	13-02089	0.2038	0.0010	0.5
0.2030	0.2040	13-02397	0.2035	0.0010	0.5
0.2038	0.2028	12-03130	0.2033	0.0010	0.5
0.0407	0.0405	13-00993	0.0406	0.0002	0.5
0.1822	0.1831	12-03153	0.1827	0.0009	0.5
0.3226	0.3210	13-02823	0.3218	0.0016	0.5
0.1803	0.1812	13-02137	0.1808	0.0009	0.5
0.1610	0.1602	13-01000	0.1606	0.0008	0.5
0.2205	0.2194	13-02590	0.2200	0.0011	0.5
0.2179	0.2168	12-03484	0.2174	0.0011	0.5
0.1970	0.1960	13-03082	0.1965	0.0010	0.5
0.0390	0.0392	13-04503	0.0391	0.0002	0.5
0.0586	0.0583	13-04500	0.0585	0.0003	0.5
0.1543	0.1551	13-04051	0.1547	0.0008	0.5
0.0774	0.0770	13-02493	0.0772	0.0004	0.5
0.1351	0.1344	13-02135	0.1348	0.0007	0.5
0.2490	0.2477	13-03111	0.2484	0.0013	0.5
0.1149	0.1143	12-06930	0.1146	0.0006	0.5
0.1136	0.1142	12-04931	0.1139	0.0006	0.5
0.0944	0.0949	13-02419	0.0947	0.0005	0.5
0.0944	0.0949	13-02419	0.0947	0.0005	0.5
0.1878	0.1888	13-02286	0.1883	0.0010	0.5
0.1509	0.1501	13-01116	0.1505	0.0008	0.5
0.0373	0.0375	12-04050	0.0374	0.0002	0.5
0.1489	0.1497	13-04570	0.1493	0.0008	0.5
0.3176	0.3159	13-00651	0.3168	0.0017	0.5
0.2778	0.2763	12-04957	0.2771	0.0015	0.5
0.0910	0.0915	13-04200	0.0913	0.0005	0.5
0.1279	0.1272	13-00357	0.1276	0.0007	0.5
0.0720	0.0716	12-03763	0.0718	0.0004	0.6
0.3220	0.3238	13-04475	0.3229	0.0018	0.6
0.2147	0.2135	12-04042	0.2141	0.0012	0.6

## Replicate Agreement Data from Case Samples

0.2325	0.2312	13-03982	0.2319	0.0013	0.6
0.1065	0.1071	13-01081	0.1068	0.0006	0.6
0.0708	0.0712	13-04592	0.0710	0.0004	0.6
0.0884	0.0889	12-06502	0.0887	0.0005	0.6
0.0883	0.0888	13-01431	0.0886	0.0005	0.6
0.1588	0.1597	13-02281	0.1593	0.0009	0.6
0.1058	0.1052	13-02149	0.1055	0.0006	0.6
0.2255	0.2268	13-00683	0.2282	0.0013	0.6
0.2081	0.2093	13-03129	0.2087	0.0012	0.6
0.1390	0.1382	13-01585	0.1386	0.0008	0.6
0.0519	0.0516	13-02730	0.0518	0.0003	0.6
0.2058	0.2046	12-06882	0.2052	0.0012	0.6
0.1358	0.1366	13-04017	0.1362	0.0008	0.6
0.1522	0.1513	13-01126	0.1518	0.0009	0.6
0.0845	0.0840	13-03122	0.0843	0.0005	0.6
0.0502	0.0505	12-05106	0.0504	0.0003	0.6
0.2955	0.2973	13-00858	0.2964	0.0018	0.6
0.2118	0.2131	13-04829	0.2125	0.0013	0.6
0.0818	0.0813	12-07294	0.0816	0.0005	0.6
0.0816	0.0811	12-04748	0.0814	0.0005	0.6
0.1291	0.1299	13-02343	0.1295	0.0008	0.6
0.1291	0.1299	13-02343	0.1295	0.0008	0.6
0.1292	0.1284	12-03387	0.1288	0.0008	0.6
0.1936	0.1924	13-04566	0.1930	0.0012	0.6
0.1766	0.1755	12-05396	0.1761	0.0011	0.6
0.1240	0.1248	13-02581	0.1244	0.0008	0.6
0.3267	0.3246	13-01090	0.3257	0.0021	0.6
0.1854	0.1866	12-03717	0.1860	0.0012	0.6
0.0770	0.0765	13-02281	0.0768	0.0005	0.7
0.1065	0.1072	12-03706	0.1069	0.0007	0.7
0.0609	0.0605	13-00465	0.0607	0.0004	0.7
0.1668	0.1657	13-03998	0.1663	0.0011	0.7
0.0453	0.0450	13-01130	0.0452	0.0003	0.7
0.2975	0.2995	13-00858	0.2985	0.0020	0.7
0.2095	0.2081	13-03466	0.2088	0.0014	0.7
0.1922	0.1909	12-04594	0.1916	0.0013	0.7
0.2053	0.2067	13-00959	0.2080	0.0014	0.7
0.2361	0.2345	12-04856	0.2353	0.0016	0.7
0.1019	0.1026	12-03812	0.1023	0.0007	0.7
0.0868	0.0862	13-01310	0.0865	0.0006	0.7
0.3616	0.3591	12-03154	0.3604	0.0025	0.7
0.2142	0.2127	13-05046	0.2135	0.0015	0.7
0.0980	0.0987	12-04074	0.0984	0.0007	0.7
0.1125	0.1117	12-08705	0.1121	0.0008	0.7
0.1112	0.1104	12-04563	0.1108	0.0008	0.7
0.2069	0.2084	13-05141	0.2077	0.0015	0.7
0.1937	0.1923	13-02890	0.1930	0.0014	0.7
0.0549	0.0553	13-05396	0.0551	0.0004	0.7
0.1777	0.1790	13-01115	0.1784	0.0013	0.7
0.1777	0.1790	13-01115	0.1784	0.0013	0.7
0.0550	0.0546	13-02251	0.0548	0.0004	0.7
0.1626	0.1638	13-04046	0.1632	0.0012	0.7
0.1351	0.1361	13-02465	0.1356	0.0010	0.7
0.1478	0.1489	12-04072	0.1484	0.0011	0.7
0.0945	0.0938	13-04140	0.0942	0.0007	0.7
0.0268	0.0266	13-04850	0.0267	0.0002	0.7
0.0268	0.0266	13-04850	0.0267	0.0002	0.7
0.1059	0.1051	12-05079	0.1055	0.0008	0.8
0.2353	0.2371	13-04548	0.2362	0.0018	0.8
0.1311	0.1301	12-03857	0.1308	0.0010	0.8
0.2348	0.2330	12-05388	0.2339	0.0018	0.8
0.2082	0.2066	12-04753	0.2074	0.0016	0.8
0.1945	0.1930	13-00953	0.1938	0.0015	0.8
0.1815	0.1801	13-04032	0.1808	0.0014	0.8
0.2161	0.2178	13-04019	0.2170	0.0017	0.8
0.1647	0.1660	12-04024	0.1654	0.0013	0.8
0.0631	0.0636	13-00720	0.0634	0.0005	0.8
0.2014	0.2030	13-03230	0.2022	0.0016	0.8
0.4267	0.4301	13-04588	0.4284	0.0034	0.8
0.0746	0.0752	13-01745	0.0749	0.0006	0.8
0.0741	0.0747	13-00601	0.0744	0.0006	0.8
0.0976	0.0984	13-03961	0.0980	0.0008	0.8
0.1334	0.1345	13-03991	0.1340	0.0011	0.8
0.1589	0.1576	12-03890	0.1583	0.0013	0.8
0.0483	0.0487	13-00195	0.0485	0.0004	0.8
0.1693	0.1679	13-00974	0.1686	0.0014	0.8

## Replicate Agreement Data from Case Samples

0.0361	0.0358	12-05218	0.0360	0.0003	0.8
0.2857	0.2881	13-00194	0.2869	0.0024	0.8
0.2968	0.2943	13-03170	0.2956	0.0025	0.8
0.2308	0.2328	13-03887	0.2318	0.0020	0.9
0.2979	0.3005	13-04001	0.2992	0.0026	0.9
0.0800	0.0793	12-05148	0.0797	0.0007	0.9
0.1934	0.1917	12-03147	0.1926	0.0017	0.9
0.2161	0.2142	13-05199	0.2152	0.0019	0.9
0.1705	0.1690	12-03133	0.1698	0.0015	0.9
0.0335	0.0338	13-04215	0.0337	0.0003	0.9
0.2784	0.2809	13-02061	0.2797	0.0025	0.9
0.2889	0.2915	12-05124	0.2902	0.0026	0.9
0.2915	0.2889	12-05124	0.2902	0.0026	0.9
0.1675	0.1660	13-03285	0.1668	0.0015	0.9
0.1768	0.1784	13-03076	0.1776	0.0016	0.9
0.1653	0.1668	13-00561	0.1661	0.0015	0.9
0.1530	0.1544	13-05253	0.1537	0.0014	0.9
0.3353	0.3384	13-02254	0.3369	0.0031	0.9
0.1838	0.1855	12-03728	0.1847	0.0017	0.9
0.0214	0.0216	12-06573	0.0215	0.0002	0.9
0.0969	0.0960	13-04152	0.0965	0.0009	0.9
0.3205	0.3175	12-03877	0.3190	0.0030	0.9
0.1798	0.1815	12-03297	0.1807	0.0017	0.9
0.1052	0.1062	12-03808	0.1057	0.0010	0.9
0.0525	0.0530	13-01163	0.0528	0.0005	0.9
0.0524	0.0529	13-04516	0.0527	0.0005	0.9
0.1047	0.1057	12-03103	0.1052	0.0010	1.0
0.1250	0.1262	12-04353	0.1256	0.0012	1.0
0.1786	0.1769	13-04585	0.1778	0.0017	1.0
0.0830	0.0838	12-07244	0.0834	0.0008	1.0
0.0616	0.0622	13-00723	0.0619	0.0006	1.0
0.2659	0.2685	13-00196	0.2672	0.0026	1.0
0.1636	0.1652	13-00579	0.1644	0.0016	1.0
0.0929	0.0920	12-04706	0.0925	0.0009	1.0
0.1981	0.1942	13-01103	0.1952	0.0019	1.0
0.2543	0.2568	13-02214	0.2556	0.0025	1.0
0.1829	0.1847	13-00708	0.1838	0.0018	1.0
0.1824	0.1842	13-02351	0.1833	0.0018	1.0
0.1712	0.1695	13-05047	0.1704	0.0017	1.0
0.2087	0.2108	13-02100	0.2098	0.0021	1.0
0.1703	0.1886	12-05086	0.1895	0.0017	1.0
0.1992	0.1972	12-03856	0.1982	0.0020	1.0
0.1990	0.1970	12-04906	0.1980	0.0020	1.0
0.1470	0.1485	12-05531	0.1478	0.0015	1.0
0.0589	0.0583	13-04243	0.0586	0.0006	1.0
0.1551	0.1567	12-03780	0.1559	0.0016	1.0
0.2012	0.2033	13-04102	0.2023	0.0021	1.0
0.0576	0.0570	13-02730	0.0573	0.0006	1.0
0.1051	0.1040	12-03304	0.1046	0.0011	1.1
0.3199	0.3233	12-04026	0.3216	0.0034	1.1
0.0281	0.0284	13-05398	0.0283	0.0003	1.1
0.2427	0.2453	13-04141	0.2440	0.0026	1.1
0.1503	0.1487	13-01034	0.1495	0.0016	1.1
0.2121	0.2144	12-04111	0.2133	0.0023	1.1
0.1278	0.1292	12-03873	0.1285	0.0014	1.1
0.1728	0.1747	12-05619	0.1738	0.0019	1.1
0.1078	0.1090	12-05084	0.1084	0.0012	1.1
0.1869	0.1890	13-04253	0.1880	0.0021	1.1
0.2218	0.2243	13-04159	0.2231	0.0025	1.1
0.2218	0.2243	13-04159	0.2231	0.0025	1.1
0.1066	0.1068	13-02247	0.1062	0.0012	1.1
0.0888	0.0878	13-01091	0.0883	0.0010	1.1
0.0265	0.0262	12-04490	0.0264	0.0003	1.1
0.0440	0.0435	13-05187	0.0438	0.0005	1.1
0.1471	0.1488	12-03148	0.1480	0.0017	1.1
0.1919	0.1897	12-03234	0.1908	0.0022	1.2
0.0870	0.0860	12-07267	0.0865	0.0010	1.2
0.1212	0.1198	12-03305	0.1205	0.0014	1.2
0.0603	0.0596	13-01878	0.0600	0.0007	1.2
0.0343	0.0339	12-04915	0.0341	0.0004	1.2
0.0771	0.0762	13-00606	0.0767	0.0009	1.2
0.2653	0.2622	12-05410	0.2638	0.0031	1.2
0.2131	0.2106	12-03353	0.2119	0.0025	1.2
0.2369	0.2341	13-00109	0.2355	0.0028	1.2
0.1939	0.1916	13-03146	0.1928	0.0023	1.2
0.0984	0.0996	13-03863	0.0990	0.0012	1.2

## Replicate Agreement Data from Case Samples

0.2206	0.2233	13-02982	0.2220	0.0027	1.2
0.0735	0.0744	12-03872	0.0740	0.0009	1.2
0.0652	0.0660	12-05020	0.0656	0.0008	1.2
0.1796	0.1774	13-04213	0.1785	0.0022	1.2
0.2841	0.2806	12-06892	0.2824	0.0035	1.2
0.2432	0.2402	13-03118	0.2417	0.0030	1.2
0.2663	0.2630	13-01110	0.2647	0.0033	1.2
0.3258	0.3299	13-05198	0.3279	0.0041	1.3
0.0869	0.0880	12-05108	0.0875	0.0011	1.3
0.1678	0.1657	13-03523	0.1688	0.0021	1.3
0.1568	0.1588	13-03709	0.1578	0.0020	1.3
0.1411	0.1429	13-04575	0.1420	0.0018	1.3
0.0394	0.0389	13-02450	0.0392	0.0005	1.3
0.0700	0.0709	12-07016	0.0705	0.0009	1.3
0.1772	0.1795	12-04947	0.1784	0.0023	1.3
0.0462	0.0468	12-06571	0.0465	0.0006	1.3
0.0546	0.0539	13-01109	0.0543	0.0007	1.3
0.2066	0.2093	13-01414	0.2080	0.0027	1.3
0.2292	0.2322	13-03113	0.2307	0.0030	1.3
0.0458	0.0464	12-04918	0.0461	0.0006	1.3
0.1678	0.1700	13-03237	0.1689	0.0022	1.3
0.1306	0.1289	13-04153	0.1298	0.0017	1.3
0.1803	0.1827	12-05529	0.1815	0.0024	1.3
0.1427	0.1446	13-00623	0.1437	0.0019	1.3
0.1571	0.1592	13-04802	0.1582	0.0021	1.3
0.1868	0.1893	13-02708	0.1881	0.0025	1.3
0.2382	0.2414	13-03563	0.2398	0.0032	1.3
0.0226	0.0223	12-06519	0.0225	0.0003	1.3
0.2369	0.2401	12-05381	0.2385	0.0032	1.3
0.0740	0.0750	13-02146	0.0745	0.0010	1.3
0.0820	0.0809	13-02136	0.0815	0.0011	1.4
0.3328	0.3283	13-02871	0.3306	0.0045	1.4
0.1461	0.1441	13-00464	0.1451	0.0020	1.4
0.0421	0.0427	13-02400	0.0424	0.0006	1.4
0.0975	0.0989	13-00914	0.0982	0.0014	1.4
0.1197	0.1180	13-00653	0.1189	0.0017	1.4
0.2596	0.2569	13-03601	0.2578	0.0037	1.4
0.1333	0.1314	12-03341	0.1324	0.0019	1.4
0.2001	0.2030	12-04587	0.2016	0.0029	1.4
0.1958	0.1930	13-01595	0.1944	0.0028	1.4
0.1983	0.2012	13-04156	0.1998	0.0029	1.5
0.0615	0.0624	12-04577	0.0620	0.0009	1.5
0.1013	0.1028	13-02445	0.1021	0.0015	1.5
0.1890	0.1862	13-00543	0.1876	0.0028	1.5
0.1411	0.1390	12-05689	0.1401	0.0021	1.5
0.1913	0.1942	13-01962	0.1928	0.0029	1.5
0.1444	0.1466	12-05385	0.1455	0.0022	1.5
0.1688	0.1714	12-04313	0.1701	0.0026	1.5
0.2173	0.2140	12-04949	0.2157	0.0033	1.5
0.0392	0.0386	12-04002	0.0389	0.0006	1.5
0.0888	0.0902	13-01758	0.0895	0.0014	1.6
0.1139	0.1157	12-05386	0.1148	0.0018	1.6
0.0828	0.0815	12-05384	0.0822	0.0013	1.6
0.1303	0.1282	13-03524	0.1293	0.0021	1.6
0.0886	0.0852	13-01605	0.0859	0.0014	1.6
0.0727	0.0739	13-00709	0.0733	0.0012	1.6
0.1209	0.1229	13-02391	0.1219	0.0020	1.6
0.0480	0.0488	13-03109	0.0484	0.0008	1.7
0.1949	0.1917	13-01056	0.1933	0.0032	1.7
0.2153	0.2189	13-01253	0.2171	0.0036	1.7
0.0356	0.0362	12-04049	0.0359	0.0006	1.7
0.0887	0.0902	13-01873	0.0895	0.0015	1.7
0.0645	0.0656	13-03444	0.0651	0.0011	1.7
0.0471	0.0463	13-02424	0.0467	0.0008	1.7
0.1060	0.1032	12-03354	0.1041	0.0018	1.7
0.0915	0.0931	12-04702	0.0923	0.0016	1.7
0.1194	0.1215	13-00360	0.1205	0.0021	1.7
0.0983	0.0966	12-03810	0.0975	0.0017	1.7
0.0852	0.0867	12-03824	0.0860	0.0015	1.7
0.0520	0.0511	13-02574	0.0516	0.0009	1.7
0.2827	0.2778	12-04109	0.2803	0.0049	1.7
0.1859	0.1892	12-04289	0.1876	0.0033	1.8
0.1858	0.1891	12-05409	0.1875	0.0033	1.8
0.1146	0.1126	12-04953	0.1136	0.0020	1.8
0.1201	0.1180	12-06572	0.1191	0.0021	1.8
0.1772	0.1741	13-04593	0.1757	0.0031	1.8

## Replicate Agreement Data from Case Samples

0.1961	0.1926	12-05956	0.1944	0.0035	1.8
0.3772	0.3841	12-03237	0.3807	0.0069	1.8
0.0979	0.0897	13-01740	0.0988	0.0018	1.8
0.2163	0.2203	13-02063	0.2183	0.0040	1.8
0.2828	0.2881	12-04064	0.2855	0.0053	1.9
0.0706	0.0693	12-06550	0.0700	0.0013	1.9
0.1574	0.1545	12-06520	0.1560	0.0029	1.9
0.0916	0.0899	12-04562	0.0908	0.0017	1.9
0.0264	0.0269	12-03483	0.0287	0.0005	1.9
0.0214	0.0210	12-03343	0.0212	0.0004	1.9
0.1256	0.1280	13-04514	0.1268	0.0024	1.9
0.1543	0.1573	13-04060	0.1558	0.0030	1.9
0.1348	0.1322	12-05530	0.1335	0.0026	1.9
0.1192	0.1169	12-06206	0.1181	0.0023	1.9
0.1819	0.1855	13-04695	0.1837	0.0036	2.0
0.1195	0.1219	13-00110	0.1207	0.0024	2.0
0.2199	0.2155	13-02981	0.2177	0.0044	2.0
0.1944	0.1905	13-01582	0.1925	0.0039	2.0
0.2136	0.2180	12-03278	0.2158	0.0044	2.0
0.0247	0.0242	13-05336	0.0245	0.0005	2.0
0.1929	0.1969	12-04108	0.1949	0.0040	2.1
0.0295	0.0289	12-04574	0.0292	0.0006	2.1
0.1650	0.1685	12-04751	0.1688	0.0035	2.1
0.1542	0.1575	13-00973	0.1559	0.0033	2.1
0.0886	0.0905	13-01092	0.0898	0.0019	2.1
0.2836	0.2776	12-04689	0.2806	0.0060	2.1
0.1323	0.1295	12-07273	0.1309	0.0028	2.1
0.1323	0.1295	12-07273	0.1309	0.0028	2.1
0.1478	0.1510	12-03601	0.1494	0.0032	2.1
0.1793	0.1832	13-00580	0.1813	0.0039	2.2
0.2821	0.2883	13-00990	0.2852	0.0062	2.2
0.3234	0.3164	12-03422	0.3199	0.0070	2.2
0.1462	0.1495	12-03252	0.1479	0.0033	2.2
0.2416	0.2361	13-02452	0.2389	0.0055	2.3
0.0342	0.0350	12-04454	0.0346	0.0008	2.3
0.1859	0.1815	12-03755	0.1837	0.0044	2.4
0.0851	0.0872	12-03229	0.0862	0.0021	2.4
0.1570	0.1532	12-03339	0.1551	0.0038	2.5
0.1128	0.1156	12-03310	0.1142	0.0028	2.5
0.1484	0.1521	12-04288	0.1503	0.0037	2.5
0.2094	0.2147	12-05121	0.2121	0.0053	2.5
0.0606	0.0591	12-03819	0.0599	0.0015	2.5
0.1832	0.1786	13-03280	0.1809	0.0046	2.5
0.1150	0.1180	13-03874	0.1165	0.0030	2.6
0.1252	0.1286	12-03878	0.1269	0.0034	2.7
0.2379	0.2315	13-00710	0.2347	0.0064	2.7
0.1794	0.1844	13-05391	0.1819	0.0050	2.7
0.1163	0.1131	12-06992	0.1147	0.0032	2.8
0.2359	0.2426	12-05014	0.2393	0.0067	2.8
0.1934	0.1989	12-05131	0.1962	0.0055	2.8
0.0804	0.0827	13-00182	0.0816	0.0023	2.8
0.1106	0.1075	12-04745	0.1091	0.0031	2.8
0.1373	0.1334	12-03247	0.1354	0.0039	2.9
0.1586	0.1633	12-05620	0.1610	0.0047	2.9
0.0841	0.0866	13-02149	0.0854	0.0025	2.9
0.1662	0.1712	13-03465	0.1687	0.0050	3.0
0.1131	0.1166	12-04844	0.1149	0.0035	3.0
0.2345	0.2418	12-06725	0.2382	0.0073	3.1
0.0860	0.0887	12-05530	0.0874	0.0027	3.1
0.2232	0.2164	13-01118	0.2198	0.0068	3.1
0.1306	0.1266	12-03862	0.1286	0.0040	3.1
0.0981	0.1012	12-03360	0.0997	0.0031	3.1
0.0315	0.0325	13-01598	0.0320	0.0010	3.1
0.2077	0.2013	13-02960	0.2045	0.0064	3.1
0.2120	0.2189	12-03249	0.2155	0.0069	3.2
0.0728	0.0705	12-03495	0.0717	0.0023	3.2
0.1505	0.1457	12-03262	0.1481	0.0048	3.2
0.2298	0.2219	12-06801	0.2258	0.0077	3.4
0.1304	0.1350	13-01432	0.1327	0.0046	3.5
0.2955	0.2854	12-04032	0.2905	0.0101	3.5
0.1576	0.1633	12-04406	0.1605	0.0057	3.6
0.1197	0.1241	12-04131	0.1219	0.0044	3.6
0.2471	0.2563	13-03995	0.2517	0.0092	3.7
0.0940	0.0975	13-03104	0.0958	0.0035	3.7
0.0693	0.0668	12-07017	0.0681	0.0025	3.7
0.1920	0.1996	12-07284	0.1959	0.0078	4.0

Replicate Agreement Data from Case Samples

0.1832	0.1907	13-05230	0.1870	0.0075	4.0	
0.2177	0.2089	12-06788	0.2133	0.0088	4.1	
0.1962	0.2058	13-00607	0.2010	0.0096	4.8	
0.2006	0.2183	13-00671	0.2095	0.0177	8.5	

## Blood Alcohol Expanded Measurement Uncertainty Table

Expanded Combined Uncertainty (k=2): 4.2%	
Reported BAC	Uncertainty ( $\pm$ )
0.020	0.001
0.030	0.001
0.040	0.002
0.050	0.002
0.060	0.003
0.070	0.003
0.080	0.003
0.090	0.004
0.100	0.004
0.110	0.005
0.120	0.005
0.130	0.005
0.140	0.006
0.150	0.006
0.160	0.007
0.170	0.007
0.180	0.008
0.190	0.008
0.200	0.008
0.210	0.009
0.220	0.009
0.230	0.010
0.240	0.010
0.250	0.011
0.260	0.011
0.270	0.011
0.280	0.012
0.290	0.012
0.300	0.013
0.310	0.013
0.320	0.013
0.330	0.014
0.340	0.014
0.350	0.015
0.360	0.015
0.370	0.016
0.380	0.016
0.390	0.016
0.400	0.017
0.410	0.017
0.420	0.018
0.430	0.018
0.440	0.018
0.450	0.019
0.460	0.019
0.470	0.020
0.480	0.020
0.490	0.021
0.500	0.021

Beverage Alcohol Expanded Measurement Uncertainty Table

Expanded Combined Uncertainty (k=2): 5.1%		
BAC Result	ABV (dilution factor = 100)	Uncertainty ( $\pm$ )
0.020	2.5	0.1
0.030	3.8	0.2
0.040	5.0	0.3
0.050	6.3	0.3
0.060	7.6	0.4
0.070	8.8	0.4
0.080	10.1	0.5
0.090	11.4	0.6
0.100	12.6	0.6
0.110	13.9	0.7
0.120	15.2	0.8
0.130	16.4	0.8
0.140	17.7	0.9
0.150	19.0	1.0
0.160	20.2	1.0
0.170	21.5	1.1
0.180	22.8	1.2
0.190	24.0	1.2
0.200	25.3	1.3
0.210	26.6	1.4
0.220	27.8	1.4
0.230	29.1	1.5
0.240	30.4	1.6
0.250	31.6	1.6
0.260	32.9	1.7
0.270	34.2	1.7
0.280	35.4	1.8
0.290	36.7	1.9
0.300	38.0	1.9
0.310	39.2	2.0
0.320	40.5	2.1
0.330	41.8	2.1
0.340	43.0	2.2
0.350	44.3	2.3
0.360	45.6	2.3
0.370	46.8	2.4
0.380	48.1	2.5
0.390	49.4	2.5
0.400	50.6	2.6
0.410	51.9	2.6
0.420	53.2	2.7
0.430	54.4	2.8
0.440	55.7	2.8
0.450	57.0	2.9
0.460	58.3	3.0
0.470	59.5	3.0
0.480	60.8	3.1
0.490	62.1	3.2
0.500	63.3	3.2

# Hamilton Microlab Beverage Dilution Verification

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## Introduction

A dilution method was created on the Hamilton Microlab 500 dual-syringe dilutor/dispenser to perform a 100 times dilution on suspected beverage alcohol samples before subsequent analysis using the previously verified Quantitative Alcohol Procedure (QAPM 2012R2). A summary of the beverage alcohol dilution method parameters is attached.

## Experimental

On 11/2/12, ten dilutions of Stolichnaya Russian Vodka (labeled to contain 40% alcohol by volume) were performed using the beverage alcohol dilution method (B100). The sample (50 µL) and diluent (4950 µL deionized water) were dispensed into a 16 x 100 mm glass culture tube, capped, and briefly mixed with a vortex mixer before being further diluted with the blood alcohol dilutor/dispenser and analyzed. To determine if significant ethanol carryover was occurring within the beverage alcohol dilutor/dispenser, deionized water was diluted after each vodka dilution and also analyzed.

## Results and Discussion

The table below gives a summary of the results from the vodka dilutions.

Dilution #	Conc. (g/100 mL)	% (v/v)
1	0.320348	40.6
2	0.322415	40.9
3	0.325316	41.2
4	0.319618	40.5
5	0.319648	40.5
6	0.319791	40.5
7	0.318302	40.3
8	0.321613	40.8
9	0.322057	40.8
10	0.319394	40.5
Mean		40.7
Std. Dev.		0.3
Rel. S.D. (%)		0.6
Bias (%)		1.7

The mean of the ten vodka analyses falls within 5% of the labeled concentration and the relative standard deviation of these replicates is less than 1%. No ethanol was detected in any of the deionized water dilutions. The supporting data from this verification is attached.

## Conclusion

This new dilution method is fit for its intended use to dilute a sample 100 times before further alcohol quantitation.

# Hamilton Microlab Beverage Dilution Verification

## Microlab 500 Dilution Method Parameters

Dilution Method: B100

Left syringe size: 5000 µL Right syringe size: 100 µL

Ratio: 1:99.0

Dilution: 1/100.0

Left Diluent Volume (µL): 4950.0

Right Air Gap Volume (µL): 5.0

Right Sample Volume (µL): 50.0

Final Volume (µL): 5000.0

	Left	Right
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Syringe Fill Speed: 5

Syringe Aspirate Speed: 2

Syringe Dispense Speed: 5 2

Syringe Fill Mode: AUTO

Air Gap Mode: AUTO

Air Gap Delay: 0.3

Wash Volume (mL): 5000.0

Left Syringe Fill Speed: 5

Left Syringe Dispense Speed: 5